CHAPTER 3: Wastewater

Purpose and Applicability of Regulations

Many fruit and vegetable processors generate wastewater that must be discharged or treated in accordance with local, state, and/or federal requirements. Chapter 3 discusses wastewater treatment and disposal options, permitting, annual wastewater reporting, and operator training requirements. This chapter also identifies wastewater regulatory agencies and common non-compliance issues.

Agencies and Their Laws and Rules

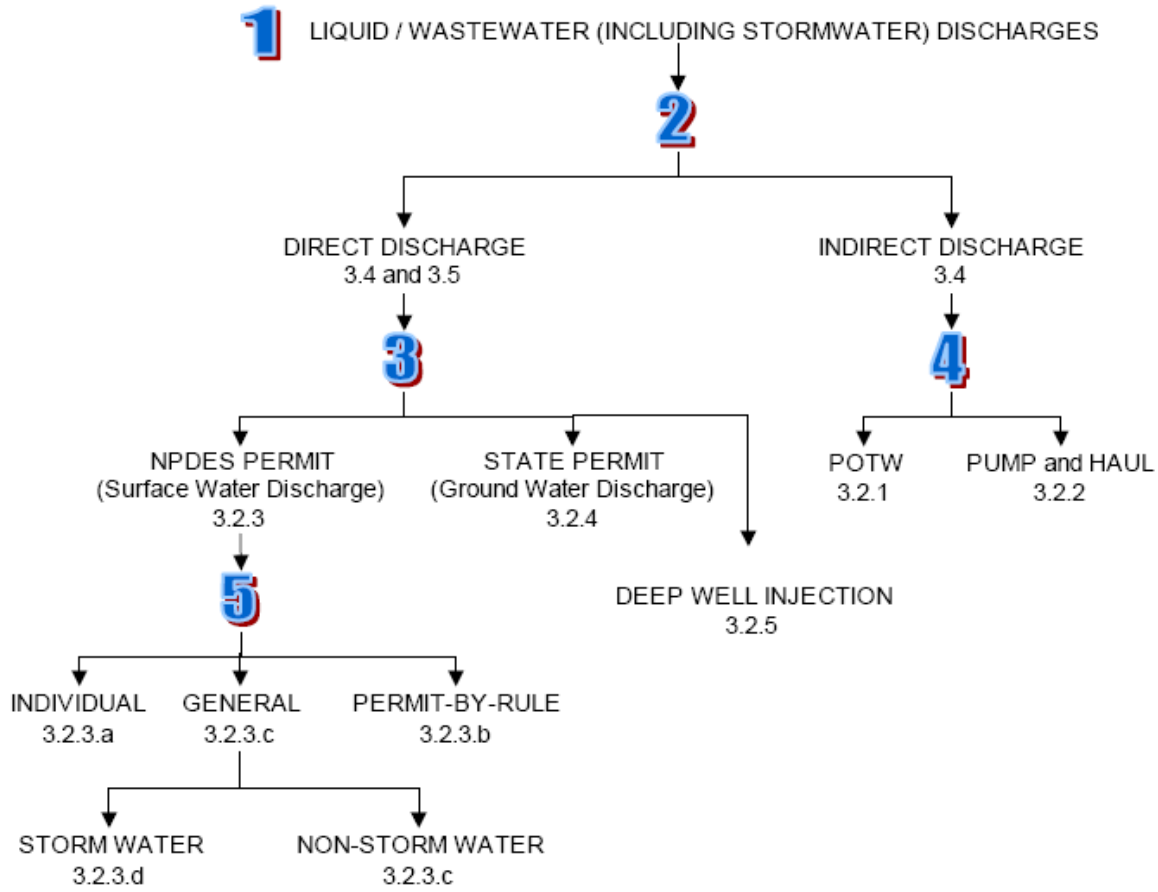
The Water Bureau (WB) of the Department of Environmental Quality (DEQ) has several roles related to wastewater discharges. The WB regulates discharges of wastewater to surface waters of the state including industrial storm water and storm water from construction activities through the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program was delegated to Michigan from the U. S. Environmental Protection Agency (EPA) in accordance with federal regulations that were enacted to implement the federal Clean Water Act. Part 31 (Water Resources Protection) and Part 41 (Sewerage Systems) of the Natural Resources and Environmental Protection Act, Public Act 451 of 1994, as amended (Act 451) and their rules provide the basis for the NPDES program in Michigan. Therefore, the WB of DEQ is the primary contact for food processors in relation to NPDES permits. Through NPDES, the WB regulates discharges from Publicly Owned Treatment Works (POTW) into state waters, and reviews local ordinances for compliance with statewide industrial pretreatment standards. While wastewater discharges that are sent to a POTW are regulated by local agencies through local ordinances, the WB has some limited enforcement discretion for these discharges. Further, the WB regulates the transportation and land application of domestic septage under Part 117 (Septage Waste Servicers) of Act 451, and responds to all types of spills when pollutants enter into surface waters. The U.S. Environmental Protection Agency (EPA) has jurisdiction to enforce federal regulations under the Clean Water Act and has an oversight role for state delegated programs, including the NPDES permit program. The WB also implements a state permit program regulating discharges to groundwater. Discharges to groundwater are regulated pursuant to Part 31 and Part 41 of Act 451 and their rules. Local entities may have additional requirements that are regulated by the wastewater treatment plant and/or building and zoning ordinances.

In This Chapter…

Transportation of wastewater is regulated by the Waste and Hazardous Materials Division (WHMD) under the Hazardous Materials Transportation Act, Public Act 138 of 1998, as amended (Act 138). There are also waste requirements for shipping and on-site management in Part 121 (Liquid Industrial Wastes) of Act 451 for liquid industrial waste, and Part 111 (Hazardous Waste Management) of Act 451 for hazardous waste.

3.1 Key to Chapter

The following key is to help identify which portions of Chapter 3 may apply to your facility. Questions in the key coincide with numbers in the flow chart. Start at Number 1 and work your way through the key and corresponding numbered questions. Your path through the key identifies the Sections of Chapter 3 that apply to your wastewater discharges.



1. Do you discharge any liquids or wastewater from your facility?

"Wastewater" is liquid waste that results from industrial and commercial processes and municipal operations, including liquid or water-carried process waste, cooling and condensing waters, and sanitary sewage. "Waste" means any waste, wastewater, waste effluent, or pollutant, including any of the following: dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, industrial, municipal, and agricultural waste. Wastewater includes storm water that comes into contact with industrial activities or materials, or which runs off a construction site that disturbs an acre or more.

If your answer is yes, then go to #2 and continue the key for each discharge. In addition, you

may be subject to Annual Wastewater Reporting requirements. See Section 3.4 “Annual Wastewater Reporting.”

If your answer is no, this chapter does not apply to you.

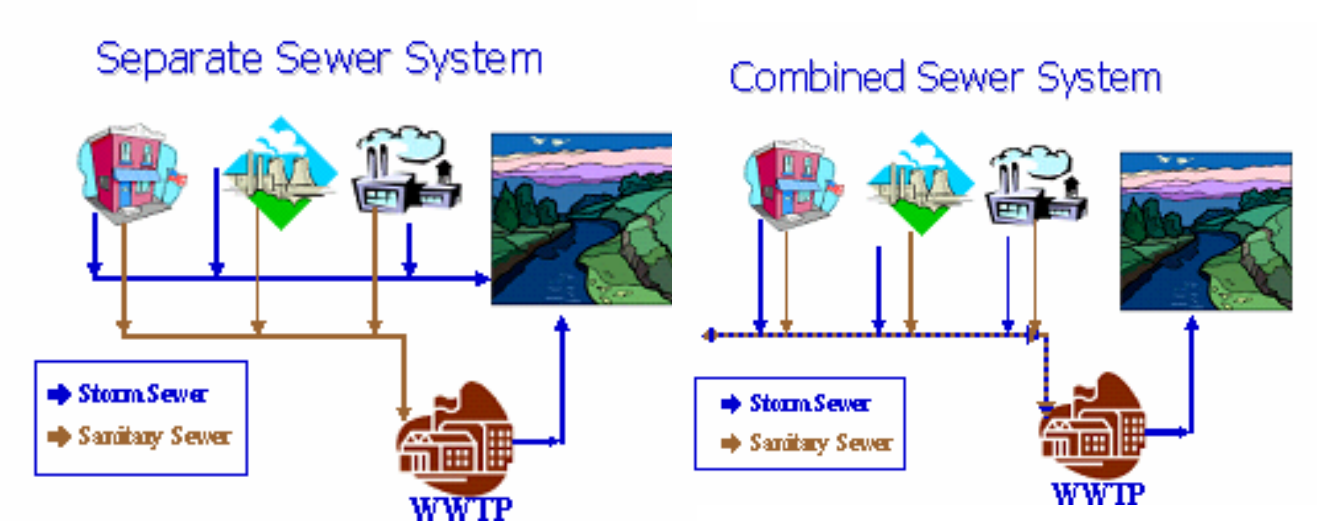
2. Is the discharge direct or indirect to waters of the state?

For the purposes of this key, an “indirect” discharge is wastewater that is treated by a Publicly Owned Treatment Works (POTW) before it is discharged to waters of the state. Whereas, a “direct” discharge goes directly into waters of the state (groundwater, streams, lakes, rivers, etc.) without treatment from a POTW via a storm sewer system (picture below), a ditch, or other conveyance.

When a sewer system is called “combined” it means that the sewers were designed to carry both storm water and non-storm water (i.e. sanitary and non-domestic source wastewater) to the POTW for treatment. If you are unsure whether your storm sewer system is combined, contact the municipality that owns and operates your system (usually a city or township).

You may have both a direct and an indirect discharge. If you have a direct discharge, go to #3. If you have an indirect discharge, go to #4.

If you own and operate your own wastewater treatment system that discharges to waters of the state, go to #3. If you plan to upgrade your wastewater treatment system, see Section 3.6 "Wastewater Treatment Technology." If you own and operate a wastewater treatment system that discharges to a POTW, go to #4.



3. Does your wastewater discharge into surface waters, groundwaters or injected deep into the ground?

All direct dischargers (to surface water, to groundwater including deep well injection) are required to have an operator certified by the state. See Section 3.5 “Wastewater Treatment Operator Training and Certifications.”

“Surface waters of the state” means all of the following: the Great Lakes and connecting waters, all inland lakes, rivers, streams, impoundments, open drains, and other surface bodies

of water within the confines of the state, but does not include drainage ways and ponds used solely for wastewater conveyance, treatment, or control. Regulated discharges include wastewater discharges from discernible, confined, and discrete conveyances, including from a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, concentrated animal feeding operation, or vessel or other floating craft.

If you have a surface water discharge, such as through a storm sewer system, go to #5; if you discharge on to land or into the ground, see Section 3.2.4 “Groundwater Permit.”

If you inject wastewater (e.g. reverse osmosis reject, brine or greywater) to a deep injection well, see Section 3.2.5 "Deep Injection Wells."

4. Do you send your wastewater for treatment to a POTW, either through a sewer system or collecting and hauling it (pump and haul)?

Any discharge to a publicly owned treatment works other than, or in addition to, sanitary sewage (water-carried wastes from toilet, kitchen, laundry, bathing, or other facilities that are used for household purposes) is nondomestic wastewater. If you discharge to a POTW, see Section 3.2.1 “Publicly Owned Treatment Works” and 3.2.1.a “Industrial Pretreatment Program (IPP).”

The majority of fruit and vegetable processing plants operate in rural areas where public sewers are not available. If your wastewater is not discharged to a POTW through a sewer system but rather collected and transported to a POTW, see Section 3.2.2 “Hazardous and Liquid Industrial Waste Transporters.”

5. If your facility directly discharges wastewater to surface waters of the state, you are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit from the DEQ’s WB.

There are three categories of NPDES permit coverage: an individual permit, a “permit by rule,” and a Certificates of Coverage (COC) issued under a general permit. The industrial stormwater permit is an example of a general permit; it is not facility specific. In order to obtain coverage under the general permit, facilities must obtain a facility specific COC. See Section 3.2.3 “Surface Water Discharge.”

Storm water (rain and snow-melt runoff and drainage) is regulated when associated with certain industrial, municipal, and construction activities. NPDES industrial storm water permit coverage is probably required if you discharge into a separate (non-combined) storm sewer system or directly into surface water (see Section 3.2.3.d). Also, construction activities that disturb more than one acre and discharge storm water to surface waters of the state are required to obtain NPDES storm water permit coverage. The term construction includes clearing, grading, and excavating activities. It does not include the practices of clearing, plowing, tilling soil, and harvesting for the purpose of crop production.

Some common violations and frequently asked questions can be found in Section 3.3, namely:

- 3.3.1 Sanitizer/Lubricants and Water Treatment Additive Requests
- 3.3.2 Floor Drains
- 3.3.3 Restrooms and Breakrooms
- 3.3.4 Pit or Trench Drain Sludge
- 3.3.5 Power Washing

- 3.3.6 Programs that help fund the upgrade of wastewater systems

3.2 Disposal Options

Your disposal options depend on the type of wastewater your business generates and the location of your company. These options include:

- Publicly owned treatment works (POTWs, also known as municipal wastewater treatment plants).
- Permitted and registered hazardous or liquid industrial waste transporters (for liquid waste that cannot be discharged directly or in any other fashion).
- Surface water discharge (includes direct discharges to a river, stream, drain, storm sewer, or ditch).
- Groundwater discharge (includes seepage lagoons, septic tank/tile field systems, and irrigation systems).
- Deep Well Injection (injecting wastewater below an underground source of drinking water "USDW," which is an aquifer with less than 10,000 mg/l dissolved solids).

3.2.1 Publicly Owned Treatment Works

Wastewater discharges to a municipal sewer system, or Publicly Owned Treatment Works (POTW), are regulated by the local sewer authority. The discharge from a POTW is regulated by the DEQ. There are variations in the design and operation of POTWs that determine the capabilities of the plant to accept and treat certain wastes. Contact your local sewer authority for a copy of the local sewer use and pretreatment ordinances to determine if your waste can be accepted by its facility. Also, review with your local sewer authority any requirements for discharge such as monitoring, record keeping, sampling, and whether industrial pretreatment regulations apply.

Most POTWs require businesses within their service area to be connected to their system for sanitary wastewater treatment and disposal. If you are constructing a new building, you will need to obtain a local permit to hook up to the POTW. Sanitary wastewater discharged directly to the POTW does not generally require pretreatment.

Many POTWs will accept some types and quantities of wastewater from non-domestic sources, including commercial, industrial and contaminated storm water, with prior approval. Some wastes are prohibited from discharging in any amount to the POTW. In general, a POTW (under the local sewer authority) will require an application be completed to request permission to discharge. POTW staff will review the application and notify you if the waste can or cannot be discharged. In some cases, wastewater must be pretreated before it can be discharged to the sewer. Also, surcharges may be assessed to recover the additional treatment expenses incurred by the POTW. A POTW accepting nondomestic wastewater may be required to develop an industrial pretreatment program (IPP) in order to accept your waste if they do not already have one.

If the POTW cannot accept your wastewater, then investigate other disposal options including

the Liquid Industrial Waste or Hazardous Waste transporter programs (see Sections 3.2.2, 2.3 and 2.4) along with pollution prevention approaches (see Chapter 10).

Industrial Pretreatment Program (IPP)

A permit or authorization from the local sewer authority may need to be obtained to discharge nondomestic wastewater to a POTW. The POTW may also determine pretreatment requirements tailored specifically to each wastewater discharge.

You cannot discharge any of the following into a POTW:

- Pollutants that exceed pretreatment standards and requirements established by the POTW.
- Pollutants that cause pass-through or interfere with the POTW.
- Pollutants that create a fire or explosion hazard in the POTW.
- Pollutants that corrode sewer conveyance or the POTW (specifically restricted is any wastewater with a pH less than 5).
- Solid or viscous pollutants that could interfere with wastewater flow.
- Pollutants that result in toxic gases, vapors, or fumes within the POTW at levels that may cause worker safety or health problems.
- Any trucked or hauled pollutants except POTW approved wastes at discharge points designated by the local sewer authority.

In addition, for industries that perform wet corn milling and discharge to a POTW the requirements of 40 CFR Part 406 must be followed. Please contact your local POTW or the DEQ, Water Bureau should you have any questions.

Reporting and Record Keeping:

The local sewer authority must know what is being discharged to its treatment system by every industrial or commercial user on the system. The sewer authority also needs to know about any spills or other problems flowing toward the treatment plant via the sewer. You must notify the POTW immediately of any discharge or release, including “slug loading,” that could cause problems at the plant. A slug loading is defined as any discharge of a nonroutine, episodic nature, including an accidental spill or noncustomary batch discharge with a reasonable potential to cause interference or pass-through, or in any other way violate the POTW regulations, local limits, or permit conditions. You must notify the sewer authority in advance of any substantial change in the amount or type of pollutants in your discharge.

If you are required to sample your wastewater, you must report results and keep records on all the sampling information for 3 years.

3.2.2 Hazardous and Liquid Industrial Waste Transportation

Wastewater, storm water, sludge and other wastes containing liquids, excluding septage waste, which is not discharged to a POTW nor permitted to be discharged on-site to surface or groundwater, must be taken to a recycling or disposal facility. Some landfills operate solidification units to treat wastes before putting it into the landfill. Facilities accepting non hazardous liquid waste, including POTWs, must notify the WHMD they are a liquid industrial waste designated facility and meet the requirements under Part 121 of Act 451 and obtain a site identification number (see Section 2.4.4). Treatment, storage and disposal facilities that accept hazardous waste must be permitted by the WHMD (except POTWs which allow the discharge of that waste into their system).

To find disposal and transporter companies, see Section 2.4.10.

A company may either hire permitted and registered hazardous or liquid waste transporters or it may haul its own liquid non hazardous waste under specific conditions without being permitted by WHMD. See Sections 2.4.4 and 2.4.5 for details on manifest and shipping record requirements and how to obtain the site identification number for your business. The site identification number must be included on all manifests. Manifests are not required for septage waste hauled by licensed septage waste transporters. Licensed septage waste haulers cannot transport liquid industrial or hazardous waste.

3.2.3 Surface Water Discharge

Applications for discharge permits are available from the WB Internet site, the WB Lansing office (517) 241-1300 or your local WB district office (see Appendix C for phone numbers). You can get help filling out your application by contacting any of these offices. Additional information is also available on the Internet at **www.michigan.gov/deqwater** (select “Surface Water” then “NPDES Permits).”

3.2.3.a Individual Permits

An individual NPDES permit is site specific. The limitations and requirements in an individual permit are based on the permittee’s discharge type, the amount of discharge, facility operations (if applicable), and receiving stream characteristics. For more information about the development of discharge limitations for common pollutants found in fruit and vegetable processing wastewater, refer to Section 3.6, Wastewater Treatment Technologies.

3.2.3.b Permit-by-Rule

“Permit-by-rule” denotes that permit requirements are stated in a formally promulgated administrative rule. A facility requiring coverage under a “permit-by-rule” must abide by the provisions written in the rule.

At this time, construction sites over one acre are the only type of facility covered by “permit-by-rule.” The rule provides an application requirement for construction sites over five acres, whereas constructions sites between one and five acres have no application requirement.

Construction sites of five acres or more must submit a form called a **Notice of Coverage** (NOC) to apply for their NPDES permit coverage. In order to submit an NOC, the applicant must first obtain coverage under the soil erosion and sedimentation control (SESC) program administered under Part 91 (Soil Erosion and Sedimentation Control) of Act 451 (see Chapter 8, page 8-2). Authorization to discharge under the rule is automatically granted upon submittal of a complete NOC, site map, application fee ($400), SESC Plans and Permit to the DEQ's Water Bureau in Lansing.

Construction sites that disturb one to five acres are provided automatic coverage so long as the site has coverage under the Soil Erosion and Sedimentation Control (SESC) Program. Even though there is no application requirement or permit fee for one to five acre sites, construction site owners must comply with the permit-by-rule requirements. Sites disturbing less that one acre could also require a permit if the site is part of a larger common plan of development or if it has the potential for adverse impacts on water quality.

Permit-by-Rule requires an owner of a construction site to provide for weekly inspections of the soil erosion and sedimentation control practices identified in their SESC Permit. In addition, the site should be inspected after any rain event that causes a discharge from the site. These inspections should be conducted by and recorded in an inspection log by a Storm Water Certified Operator. The certification materials and testing to become a Storm Water Certified Operator are available in each of the WB's district offices (See Appendix C for phone numbers).

For more information on Permit-by-Rule including application materials, certified operator exam training materials and exam schedules, or storm water program contact information, contact any WB district office or go to **www.michigan.gov/deqwater** (select "Surface Water" then "Storm Water").

3.2.3.c General Permits

A general permit may be available to permittees with certain similar operations and/or types of discharge. Coverage under a general permit will only be granted when the general permit conditions provide the needed level of protection for the receiving water. Wastewater discharges at some locations may require an individual permit based upon site-specific concerns. Facilities determined to be eligible for coverage under a general permit receive a **Certificate of Coverage** (COC) from the WB usually within four to six weeks of submitting a complete application. Some general permits include: Storm Water from Industrial Activities (discussed below), NonContact Cooling Water, and Hydrostatic Pressure Test Water.

3.2.3.d Storm Water from Industrial Activities General Permit

There are two types of general storm water permits available in Michigan: a baseline general permit and a general permit with monitoring requirements. Facilities may also receive coverage for industrial storm water discharges through a site-specific individual permit.

If your facility's storm water discharges to a surface water of the state via a separate storm sewer system or similar conveyance, two steps are required to determine if storm water permit coverage is necessary.

Step one is to determine if the industry is identified in the federal storm water regulations. Standard Industrial Classification (SIC) codes prepared by the federal Office of Management and Budget, or narrative descriptions, are used to identify regulated facilities. SIC codes describe the primary nature of business in which a facility is engaged. Most food processors have an SIC code beginning with "20" and are regulated under this program. As associated with food processing, the following industrial categories are regulated:

20-- FOOD AND KINDRED PRODUCTS
(All SIC's beginning with 20)

42-- MOTOR FREIGHT TRANSPORTATION AND WAREHOUSING, including:
(All SIC's beginning with 42 including)
4221 FARM PRODUCT WAREHOUSING AND STORAGE
4222 REFRIGERATED WAREHOUSING AND STORAGE
4225 GENERAL WAREHOUSING AND STORAGE

You can find your four-digit SIC code in your corporate tax returns under Schedule K listed as either “Business Activity Code” or “Manufacturers Identity Code.” You may also call Michigan’s Unemployment Agency at (800) 638-3994 and provide your federal identification number to get your official SIC code. A more complete listing of SIC codes can be found on the industrial storm water program page, from **www.michigan.gov/deqwater** (select “Surface Water” then “Storm Water” then “Industrial Program”).

The second step is to determine whether storm water could come into contact with industrial materials or activities at the site. Basically, if you store or have material handling of materials (wood pallets, barrels, fruits and vegetable waste, etc.) related to your industrial activity outside without permanent covering (exempting final products manufactured for use outside such as a completed automobile), then it can come into contact with storm water and the quality of the storm water runoff could be affected. The term “exposure” is used in the storm water program to indicate the potential for contact between storm water and your industrial materials. This includes outside storage of waste dumpsters and any raw materials associated with your industrial activity.

If you are regulated by SIC and have a discharge to surface waters of the state, then you can take one of two actions; either you can certify that you have no exposure or you must obtain permit coverage. The action that you may take will be dependent upon exposure at the site. Guidance as to whether you have exposure can be found on the industrial storm water program web site **www.michigan.gov/deqwater** (select “Surface Water” then “Storm Water” then “Industrial Program), select the document entitled “No Exposure Certification Guidance.”

If after reviewing the “**No Exposure Certification Guidance**” form, you find that you do not have exposure at the site, then you can submit a “**No Exposure Certification**” form instead of obtaining coverage under the general permit. If you chose to operate your facility without exposure, then you may still want to have a team of storm water certified operators among your housekeeping team to help recognize practice changes that could cause you to need coverage (such as moving equipment outside).

In summary, if you answer "yes" to all of the following three questions, you need a permit:

1. Do I have a storm water discharge to surface waters of the state?
2. Is my company specifically regulated by the storm water program?
3. Do I store or transport industrial materials outside that could come in contact with storm water?

To apply for coverage, submit a **"Notice of Intent (NOI)" (EQP 4664)** to the WB Permits Section. If coverage under the Storm Water from Industrial Activities General Permit is appropriate, a Certificate of Coverage will be issued. There is an annual storm water permit fee of $260. Before obtaining a COC, you must:

- Have a storm water certified operator who has supervision over the control structures at the facility (see Section 3.5).
- Have eliminated any unauthorized non-storm water discharges to the storm sewer system and waters of the state.
- Have a Storm Water Pollution Prevention Plan (SWPPP) developed and implemented for existing facilities, or a SWPPP developed and ready for implementation at new facilities (see Section 6.2.4).

3.2.4 Groundwater Discharge

The Part 22 rules of Part 31 (Water Resources Protection) of Act 451 govern authorization to discharge to the groundwater in the state of Michigan. There is an annual fee for groundwater permit coverage. The discharge authorizations in the rules are established in order of relative threat to the environment, and the program's annual fees are set in the same manner. The annual fee can be $200, $1500 or $3650, depending on the type of permit that is appropriate for your facility.

Certain activities are exempt from obtaining permits; these are listed in Rule 323.2210; while discharge authorizations are issued under:

- Rule 323.2210(y) (site specific low volume discharge)
- Rule 323.2211 (notification only)
- Rule 323.2213 (notification with certification)
- Rule 323.2215 (general permit)
- Rule 323.2216 (permit with specific treatment system requirements)
- Rule 323.2218 (full permit)

The following sections discuss the types of groundwater discharge authorizations that are available.

GROUNDWATER DISCHARGE APPLICATION

The groundwater discharge authorization application lists the types of discharges that require permits. The application form is quite lengthy because it contains a great deal of guidance on how to apply for a permit and who needs a permit. An applicant actually fills out and submits only a small portion of the application packet. Pages 14-17 require general information such as owner, facility address, site maps, etc. Page 17 contains the signature block required to be signed by the applicant. There are two additional pages that must be filled out, each specific to the authorization. The groundwater application has an index on page 18 which indicates the appropriate additional pages that must be included in the application.

An application for a groundwater discharge authorization can be accessed via the DEQ's web site at **www.michigan.gov/deqwater** (select "Ground Water Discharge" then look under "Permits"). You may also call the Water Bureau's Lansing office, (517) 373-7262; or WB staff in your local DEQ district office (see Appendix C for phone numbers) for an application. Instructions to apply for discharge permit coverage are included with the authorization information below and you can get help filling out an application by contacting any WB office.

GROUNDWATER DISCHARGE PERMIT RENEWAL

Renewal of a groundwater discharge permit can be divided into two categories. The first is for the same quantity and characterization of discharge(s), and the same treatment process as the previous permit. The second is for effluent quantity, characterization or treatment processes that are different from the previous authorization. In both cases the applicant must submit a complete permit application, but the information to be included with the permit application will be more detailed if the discharge or treatment system is different.

Groundwater Discharge Permit Renewal: No Change in Discharge

The applicant must submit a complete permit application, as described above, and the following information:

- A certification by the discharger that the discharge will consist of the same quantity, effluent characterization, and treatment process as previously permitted.
- A narrative description of the facility's compliance history with effluent and groundwater permit limits and sampling frequency.
- If permit limits were exceeded, describe the steps taken to bring the facility into compliance.
- An evaluation of whether there are general trends in the effluent or groundwater sampling data that may indicate the discharge is approaching permit limits.
- An up to date site map.
- A current groundwater contour map, a narrative evaluation of whether changes to the existing groundwater monitoring system are warranted and the rationale for any proposed change.
- The most recent groundwater quality results from all wells on site.
- The most recent effluent quality results.
- The most recent static water levels and groundwater elevations from all wells on site.

Groundwater Discharge Permit Renewal: Modified Discharge - Reissuance

A permittee may request a modification of their discharge at any time, either during the life of the permit, or at reissuance.

For a discharge where the applicant changes the effluent quantity, characterization or treatment process at the time of reissuance, the applicant must submit a complete application and submit the following additional information:

- An updated submission of the items listed corresponding to the differences between the proposed discharge and the discharge previously permitted, as appropriate, including:
    - The basis of design as required by Rule 2218(2).
    - An evaluation of the feasibility of alternatives to discharge to the groundwater in accordance with R 323.2219.
    - The wastewater characterization as required by R 323.2220.
    - The hydrogeologic report as required by R 323.2221.
    - If a standard applicable to the discharge is to be determined under R 323.2222(5), the information necessary to determine that standard, including whether a substance is a hazardous substance under part 201.
    - If applicable, the monitoring plan as specified by R 323.2223.
    - If applicable, a description of the discharge methods and information that demonstrate that the requirements of R 323.2233 will be met.
    - If applicable, information that demonstrates that the requirements of R 323.2237 will be met.

- A narrative description of the facility's history of compliance with effluent and groundwater permit limits and sampling frequency.
- If permit limits were exceeded, the steps taken to bring the facility into compliance.
- An evaluation of whether there are general trends in the effluent or groundwater sampling data indicating that the discharge is approaching permit limits.
- An updated site map.
- A current groundwater contour map and a narrative evaluation of whether changes to the existing groundwater monitoring system are warranted and the rationale for any proposed change.
- The most recent groundwater quality results from all wells on site.
- The most recent effluent quality results.
- The most recent static water levels and groundwater elevations from all wells on site.

Groundwater Discharge Permit Renewal: Modified Discharge – In Effect Permit

For a discharge where the applicant changes the effluent quantity, characterization or treatment process during the period when the permit is In Effect, the following process will apply:

A discharger who proposes to modify the **quantity or effluent characteristics** of a discharge shall notify the department of the proposed modification before it occurs. If the department determines the proposed modification is **minor based on the quantity or quality of the discharge**, then the department may modify the permit as requested and include new terms or

conditions that may be necessary to ensure that the terms of R 323.2204 are met. If the department determines that the **proposed modification is significant** based on the quantity or quality of the discharge, then the discharger shall submit a complete permit application for reissuance of the permit similar to (b) above.

A discharger who proposes to modify the **treatment process** of a discharge shall notify the department of the proposed modification before it occurs. Unless the department notifies the discharger within 30 calendar days that the proposed modification may affect compliance with limitations on the quality or quantity of the discharge, the discharger may make the modification. If the department notifies the discharger and determines that the proposed modification is **minor based on the quantity or quality of the discharge**, then the department may modify the permit as requested and include new terms or conditions that may be necessary to ensure that terms of R 323.2204 are met. If the department notifies the discharger and determines that the proposed modification is **significant based on the quantity or quality of the discharge**, then the discharger shall submit a complete permit application for reissuance of the permit similar to (b) above.

3.2.4.a Exemptions, Rule 2210

Certain discharges to the ground are exempt from needing authorization from the department, such as sanitary sewage that is discharged at less than six thousand gallons per day when the discharge is under the jurisdiction of the local county health department and Non-contact cooling water **that has no additives** where there is less than 10,000 gallons per day, and where the source water was from a municipal water supply (or alternate approved source)(Rule 2210(q)).

A more complete list of exempted discharges can be found in the appendix and in the groundwater discharge authorization application. While the law and rules provide that a person does not need a permit for the discharge of the above discharges, the law also does not waive liability for causing injury to the waters of the state. This means the discharge cannot cause waters of the state to lose their usefulness for drinking, agriculture, recreation, industry, or other protected uses. Even though exempted activities do not require a permit, there are certain conditions that must be met according to the law, including the following:

- A prohibition against causing physical damage to neighboring properties or creating nuisance conditions (i.e. runoff onto adjacent properties, ponding or flooding of adjacent properties, odors, etc.).
- A prohibition against creating a site of environmental contamination that would need to be cleaned up.

For exempted discharges an application form does not have to be submitted. In addition, some discharges to the ground or groundwater which are not specifically addressed under Rule 2210(y) may be authorized on a case-by-case basis. Such is the case if the applicant demonstrates to the department's satisfaction that the discharge will not have a significant potential to be injurious based on volume and constituents of the discharge. In order for the department to determine if a particular discharge exemption will be allowed a discharger must submit an application form that includes a narrative description justifying the request for the Rule 2210(y) authorization with the permit application form.

3.2.4.b Notification, Rule 2211

Some wastewater dischargers may be able to obtain an authorization to discharge by notification. These include:

Wastewater Type	Daily Maximum Discharge, Gallons
Non-contact Cooling Water, no additives	>10, 000
Washing of whole, unprocessed food items.	<50,000

To obtain this type of authorization a facility must complete a groundwater discharge authorization application. A facility is authorized to discharge once an adequate and complete application is received by the department. As long as the discharger certifies that they meet the individual rule criteria, a facility will be authorized to discharge at the time an adequate and complete application is received by the department. The WB will send the applicant an acknowledgement letter indicating whether the application is complete or deficient. If deficient, the deficiencies must be corrected before the discharge is authorized. The annual fee for this type of authorization is $200.

3.2.4.c Notification with Certification, Rule 2213

A notification with certification is required for specific discharges. These discharges include:

Wastewater Type	Daily Maximum Discharge, Gallons
Non-contact cooling water, with additives	< 10,000
Egg washing wastewater, may contain additives	< 10,000

To obtain this type of authorization a facility must complete a groundwater discharge authorization application. Within 60 calendar days of receiving a complete application form the department will either issue a certification verifying that the discharge is authorized or will indicate why the discharge can not be authorized under the rule. The annual fee for this type of authorization is $200.

3.2.4.d General Permit, Rule 2215

An authorization for certain discharges can be granted by the department under a general permit.

Wastewater Type	Daily Maximum Discharge, Gallons
Vehicle wash, not open to the public	< 2,000
Slaughterhouse	< 2,000 (annual average)

To apply for coverage, submit the permit application to the Department along with information that demonstrates conditions required by the general permit. A facility is authorized to discharge to the ground or groundwater once they receive a Certificate of Coverage from the department, which verifies the discharge is authorized under this rule. The annual permit fee for Rule 2215 authorization is $1,500.

3.2.4.e Discharge Permit, Rule 2218

Large volume or complex discharges that are not covered above must obtain authorization under Rule 2218. The following are some examples of discharges that require a 2218 permit.

- Fruit and vegetable process wastewater.
- Cooling water at greater than 5,000 gallons per day with additives.
- Non-contact cooling without additives at greater than 10,000 gallons per day, source water not approved by the department.
- Non-contact cooling water with additives at greater than 10,000 gallons per day.

Applications for this permit include submittal of the following types of information along with the permit application: a basis of design for the wastewater treatment system, discussion of alternatives to a groundwater discharge, wastewater characterization, a hydro-geological study and groundwater monitoring and a discharge management plan. Facilities are strongly urged to obtain assistance from environmental consultants for completion of these items. The department has prepared Guidesheets I-VI that provide assistance to the applicant on the types and format of information that are required for this additional information. The annual permit fee is $3,650.00.

If a fruit and vegetable processor has other waste streams addressed by Rules 2210-2215 these will be included in the 2218 discharge permit. Multiple permits will not be required.

Guidance information on groundwater discharge permit and application requirements (Part 22 Guidesheets) are available on the Internet at **www.michigan.gov/deqwater** (select "Groundwater Discharge").

3.2.5 Deep Injection Well Discharges

In Michigan, two food processing facilities own deep injection wells for disposal of wastewater. Class I injection wells dispose of industrial hazardous, industrial nonhazardous and municipal (non-hazardous) waste.

Class I injection wells are sited such that they inject below the lowermost underground source of drinking water and a confining zone above an injection zone. Injection zone reservoirs typically range in depth from 1,700 to over 10,000 feet below the surface. Typical costs associated with constructing a deep injection well are around a million dollars.

Marietta Newell, USEPA Region 5
Phone: 312-353-4543
Email: newell.marietta@epa.gov
Mailing Address:
77 West Jackson Blvd.
Chicago, IL 60604-3590
Website:
http://www.epa.gov/region5/water/uic/uic.htm

Class I injection well discharges in Michigan are regulated both by the United States Environmental Protection Agency, and the Michigan Department of Environmental Quality's Office of Geological Survey.

A permit must be obtained from both the MDEQ and the USEPA for this wastewater discharge option and consultants are typically utilized for permitting, construction and testing of these wells. The timeline associated with permit issuance would be six months to a year for both agencies. For more information, contact MDEQ, OGS (Lansing Office 517-241-1515 or appropriate District Supervisor).

There are some general operating requirements for operation of a deep injection well including regular testing to demonstrate mechanical integrity of the well. There is a monthly reporting requirement for volumes of fluid injected and operating pressures. Finally, for the state program there is a $2,500 fee per disposal well.

In those instances where the waste is considered hazardous and the processor is storing and or treating the waste prior to discharge, the facility is subject to the Treatment, Storage, and Disposal Facilities permit. Discuss the requirements with MDEQ Waste and Hazardous Materials Division.

3.3 Common Non-Compliance Issues and Frequently Asked Questions

There are several issues that are commonly associated with non-compliance or areas where staff receive many questions. The following section discusses some of these.

3.3.1 Sanitizer/Lubricants and Water Treatment Additive Requests

Biocides or algaecides used to prevent freezing, scale build-up or slime growth, along with sanitizers and sanitizing lubricants can be found in the wastewater at fruit and vegetable processing facilities. As such, these Water Treatment Additive (WTA) products must be included in the application for wastewater discharge. In addition, whenever sanitizers or other WTA's are changed, the use of the new WTA could change the characteristics of the wastewater effluent. Both groundwater and NPDES permits require prior review and approval from the WB before new WTA's can be used.

For NPDES Permits:

Any WTA that is discharged to a surface water of the state from a NPDES permitted discharge requires prior review and approval by the WB. The process to receive WTA approval includes submittal of the following information to the WB by the NPDES permittee proposing to use and discharge the WTA:

1. The WTA Material Safety Data Sheet (MSDS).
2. The proposed WTA discharge concentration.
3. The discharge frequency (i.e., number of hours per day, week, etc.).
4. The outfall(s) the WTA is to be discharged from.
5. The type of removal treatment, if any, that the WTA receives prior to discharge.
6. The WTA function (i.e., microbiocide, flocculant, etc.).
7. A 48-hour LC_{50} or EC_{50} for a North American freshwater planktonic crustacean (either Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.).
8. The results of a toxicity test for one other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of Rule 323.1057(2)(a) of the Water Quality Standards. Examples of tests that would meet this requirement include a 96-hour LC_{50} for a rainbow trout, bluegill, or fathead minnow.

The list of WTAs for which the WB currently has the required toxicity information (described in items 7 and 8 above) is available on the Internet (instructions in the box below).

More information on obtaining WB authorization to discharge water treatment additives can be obtained at **www.michigan.gov/deqwater** (select "Water Quality Monitoring," "Assessment of Michigan Waters," then look under "Information" for the "Water Treatment Additive List").

For Groundwater Discharge Permits:

In the event a permittee proposes to discharge WTAs to groundwater, the permittee shall submit a request to discharge WTAs to the Department for approval. Such requests shall be sent to the Surface Water Assessment Section, Water Bureau, Department of Environmental Quality, P.O. Box 30273, Lansing, Michigan 48909, with a copy to the Department contact listed on the cover page of the applicable permit. Written approval from the Department to discharge such WTAs at specified levels shall be obtained prior to discharge by the permittee. Additional

monitoring and reporting may be required as a condition for the approval to discharge the WTA. WTAs include, but are not limited to, such chemicals as herbicides used to kill weeds and grasses as part of lagoon maintenance.

A request to discharge WTAs to groundwater shall include all of the following:

a. Product Information:
    1. Name of the product;
    2. Material Safety Data Sheet;
    3. Product function (i.e. microbiocide, flocculants, etc.);
    4. Specific gravity if the product is a liquid; and
    5. Annual product use rate (liquids in gallons per year and solids in pounds per year);

b. Ingredient Information:
    1. Name of each ingredient;
    2. CAS number for each ingredient; and
    3. Fractional content by weight for each product;

c. The monitoring point from which the WTA is to be discharged;

d. The proposed WTA discharge concentration;

e. The discharge frequency (i.e., number of hours per day and number of days per year);

f. The type of removal treatment, if any, that the WTA receives prior to discharge;

g. Relevant mammalian toxicity studies for the product or all of its constituents (if product toxicity data are submitted, the applicant shall provide information showing that the product tested has the same composition as the product listed under Item “a” above.) Preferred studies are subchronic or chronic in duration, use the oral route of exposure, examine a wide array of endpoints and identify a no-observable-adverse-effect-level. Applicants are strongly encouraged to provide the preferred data. If preferred data are not available, then the minimum information needed is an oral rat LD50 study. In addition, an environmental fate analysis that predicts the mobility of the product/ingredients and their potential to migrate to groundwater may be provided.

If the discharge of the WTA to groundwater is within 1,000 feet of a surface water body, the following information shall also be provided:

a. A 48-hour LC50 or EC50 for a North American freshwater planktonic crustacean (either Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.); and

b. The results of a toxicity test for one other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of Rule 323.1057(2) of the Water Quality Standards.

The required information is currently available in the WB files for the following water treatment additives, which are associated with food processing facilities:

- AquaSan Lube Rite STPB
- Conade 2001
- EC 655 Heavy Duty DegreaserTM

- Foam Out® 625
- Hydro ZymeTM 657
- Lubodrive FP
- Lubodrive FP Plus
- OdorOut® FDA
- Resonator 2
- Ultrex PBB
- Xzyme® 658

So, if you intend to use one of the water treatment additives listed above, then only the annual product use rate and the information in items c through f need to be submitted to the WB.

Please note that the availability of toxicity information for a water treatment additive does not constitute approval to discharge the water treatment additive
You must receive facility-specific and written approval

For Discharges to a POTW
If you discharge to a POTW, then check with the local sewer authority to see what is required to change additives or products, as there may be similar restrictions. Some communities might have local requirements for cleaning solutions. For example, some communities require that low or no phosphate detergents and additives be used. It is generally recommended that low or no phosphate detergents and additives be used in all areas. Calling the POTW before discharging is especially important for products associated with boiler blow down activities and other sanitizers.

3.3.2 Floor Drains

Most food processing facilities have floor drains and trench drains that are connected to their wastewater treatment system and are authorized under their facility's discharge permit. However, an inspection of the facility should be conducted to assure that all floor drains are properly connected to the wastewater system and are authorized under a permit.

Except for discharges authorized under a discharge permit program, it is unlikely that a groundwater or surface water discharge permit will be issued for floor drain waste as most of these built in connections and conveyances are prohibited in local building and plumbing codes. Sections 701.2 and 1104.3 of the Michigan Plumbing Code (R 408.30701 et seq.) require floor drain discharges go to an available sanitary sewer system or an approved private system and prohibit connections of floor drains to storm sewers. Many fluids are prohibited from discharge entirely due to the hazardous chemicals in them. Some POTWs will accept waste from floor drains, such as antifreeze, engine wash down water, small quantities of oily substances, etc., at specific rates and times. Wastewater that is not authorized for discharge must be managed and disposed of as a liquid industrial waste or hazardous waste depending on its classification. See Section 2.4.2 for information on how to determine waste classification.

To get a copy of the Michigan Plumbing Code contact the DLEG, Bureau of Construction Codes and Fire Safety, Plumbing Division, at (517) 241-9330 or go to www.michigan.gov/dleg (select "Construction Codes & Fire Safety," "Divisions," then "Plumbing Division").

Keep water use to a minimum when cleaning floors. Hoses should not be used to "wash down" the floors. Mop floors with biodegradable floor detergent according to the manufacturer's directions. Any accumulation should be recovered by a wet vacuum or mop.

Minimize or eliminate the use of degreasers and solvents where possible. Degreasers put oil into a solution, which makes it nearly impossible to remove the oil from the wastewater by conventional methods. Overuse of degreasers will make oil/water separators ineffective. Degreasers could also contain volatile organic compounds, which can be toxic and are highly mobile.

Currently, waste entering floor drains is legal only if the discharge goes to one of the following:

- To the facility's wastewater collection system that treats the wastewater and has authorization through the Groundwater Discharge Permit Program or NPDES (Sections 3.2.3 and 3.2.4).

- POTWs, if in accordance with local ordinances (3.2.2)

- Holding tanks, which the wastewater and sludge is later pumped out and hauled to an approved facility (See Section 3.2.2). Holding tanks should be located to allow for easy access for cleaning and repair. If a facility wants to dry the materials out on-site to save on transportation and disposal costs, see Section 3.3.5.

Any floor drains that do NOT discharge to any of the above must be closed off or rerouted to an authorized destination. Plugging the drainpipe that connects to the storm sewer/drain with concrete can eliminate the discharge. However, if the discharge access is a direct manhole into a storm sewer or drain, a concrete contractor can prevent future access to the manhole by installing a lock-down concrete cap or bolt down cover. Be careful not to block drainage in an existing storm drain with concrete.

For holding tanks, aboveground storage tanks (AST) are recommended. These allow the prompt detection and correction of any leaks. ASTs must be constructed with a material that is compatible with the waste liquids. It is recommended all ASTs have secondary containment that is designed to allow easy access for cleaning and regular inspections (See Section 4.1 and Section 6.2.2). The secondary containment structure should be equipped with a sump pump to allow easy removal of collected precipitation or any waste liquids in the event of a leak. If there is a sump pump it should not activate automatically. Instead, it should only allow manual activation after verification that the liquid is precipitation or waste water. If precipitation needs to be removed from the containment area, meet the WB requirements to discharge on-site. If waste water is being removed, the liquid should be pumped into a disposal container and managed appropriately (see Section 2.3 and 2.4). Check for the cause of any waste water leak and repair the AST if necessary. Concrete vaults can be used as secondary containment if the structure is constructed with a water-stop-joint design and the concrete is coated with an

impermeable material compatible with the waste. Concrete vaults may not be used as primary containment due to the potential to crack.

Although not recommended because of the difficulty to inspect for leaks, underground storage tanks (USTs) can also be used for holding tanks. If made of steel, USTs should be equipped with cathodic protection. Double-walled tanks are recommended. They should also have leak detection and a high-level alarm to alert over flows or leaks. If the wastewater contains UST regulated substances, you must call the WHMD Storage Tank Unit at 517-335-7211 to discuss if you need to meet the requirements in Section 4.3.1.

All piping leading from the floor drains to the holding tank should be double-walled. Buried pipe should also have some type of leak detection system.

3.3.3 Restrooms and Breakrooms

Standard domestic wastewater may be discharged to a POTW, privately owned sanitary treatment system, or septic system. Pouring non-domestic wastes down the drain or into the toilet is illegal unless the toilet drains to a municipal treatment system AND the discharge is in compliance with the local sewer authority regulations.

3.3.4 Pit or Trench Drain Sludge

This type of material is the semi liquid residue that accumulates in the bottom of trench drains or holding tanks that receive non-domestic wastewater. Trench drains or holding tanks are typically located in loading or unloading areas; they may also be located so they are convenient to receive vehicle wash water or other types of non-domestic wastewater. This waste may contain oil, antifreeze, heavy metals, degreasers, or other contaminants. Sludge could also be removed from trench drains located in the food processing areas. As noted previously, this type of wastewater cannot be discharged to the ground, the groundwater, or to a septic system, nor can it be discharged to a POTW without prior approval. This type of waste cannot be disposed in your facility's solid waste containers if it contains liquids. You need to determine if it is liquid industrial waste or hazardous waste (see Section 2.4.2) to decide how to handle pit or trench drain sludge.

If the waste is not hazardous there are three options for handling the sludge, depending on its water content.

1. Check to see if your POTW will allow you to pump this liquid into the sewer system. You may be required to pretreat the liquid portion before disposal to a POTW. A common method of pretreatment is to pass the liquid through a grit chamber and an oil/water separator.

   If your facility has either a grit chamber or an oil water separator, you need to have an inspection and maintenance program in place to ensure that the chamber/separator continues to operate effectively. Check with your local POTW and the building/zoning authority for local requirements. The cleaning frequency is often based on the size of the separator and the volume and contents of the wastewater that flow through it. Your program should include:

- Regular inspections.
- Recycling or disposal of separated oil (see Section 2.4.9.a).
- Sludge analysis to determine proper disposal options.
- Cleaning/removing sludge and refilling the chamber with water (to ensure proper oil water separation).

2. Have the sludge pumped from the holding tank or trenches by a permitted and registered liquid waste transporter for disposal at an approved facility (see Section 3.2.3). If the sludge is removed from the food processing area trenches, also see Section 2.2.1 for information about land application. Under no circumstance should wastewater or pit sludge from trenches be directed into a facility's on site septic tank/tile field system.

3. Remove the sludge from the holding tank or trench and dry the sludge on-site for later disposal in a licensed solid waste landfill. Before choosing this option, contact the landfill authority to see if they will accept this type of waste and what kind of containers they want to receive the dried sludge in. Also discuss this option with your local WHMD district office and the Air Quality Division. You may also want to check if any local ordinance prohibits this practice. With this alternative you may produce odors. Consider what is in the sludge that may cause odors as neighbors will report nuisance odors to local and state agencies.

   When drying, be sure any liquid is controlled such that none is allowed to impact the ground or groundwater, or drain into the on-site sewer system. If you are able to dry the material put the dried sludge in solid waste containers and have them taken to the licensed landfill. There cannot be any free liquid left in the sludge. See Section 2.2 for more information on solid waste disposal.

3.3.5 Power Washing

Regulations for power washing wastewater discharges depend on where the discharge goes. Options for this wastewater are described in the following.

Power Washing Discharges to Ground (Groundwater Discharge Permit Program)

The DEQ may authorize a discharge to the ground or groundwater from a power washing operation by an exemption, notification, or permit, depending on the type of discharge.

A groundwater discharge is exempt if the washing is done by a commercial operator or performed in an industrial setting to remove non-polluting substances from vehicles and surfaces, and only clean water with no additives is used for the cleaning. In this instance, discharges must go into the groundwater; they may not be directed to a storm drain or surface water. For more details, see the **"Part 22 Groundwater Discharge Authorization Application,"** available via the DEQ web site **www.michigan.gov/deqwater** (select "Groundwater Discharge" then look under "Permits").

Power washing operations that do not qualify for an exemption or authorization via notification may be able to obtain a site-specific exemption or a groundwater discharge permit. It will

depend on the quality and quantity of the wastewater and discharge location. Interior washing of vehicles does not qualify for permit by notification process.

Power Washing Discharges to Surface Water (NPDES)

The discharge of power washing wastewater directly to a creek, river or other water body, directly or through a storm sewer, or other conveyance, is illegal without first obtaining a NPDES permit (Section 3.2.3) from the WB. An NPDES permit would be necessary for each job site where there will be power washing discharge from vehicles or equipment. Applying for an NPDES permit for each site will likely not be a practical option for mobile power washing operations. However, if no detergents or other compounds are used and the discharge will only be from routine building wash-down or pavement washing an NPDES permit is generally not required assuming there have not been spills or leaks of toxic or hazardous materials that would contaminate the wash water. For anything other than routine building wash down (use of power washing to remove paint is not routine building wash down), you should discuss your options with a district staff member of the WB (See Appendix C for contacts).

Power Wash Hazardous Waste Characterization

If you do not have authorization from the Water Bureau to dispose the wash water as discussed above, it will be necessary to determine if the wastewater or other wastes from power washing are hazardous waste before shipping it off-site. For example, if your company is power washing old paint off a building, paint chips need to be collected, evaluated, and disposed of properly. Paint chips cannot be left on the ground at the job site. Old paint stripped off commercial buildings may contain high enough concentrations of metals (such as lead, chromium, cadmium, and mercury) to be regulated hazardous waste. Another example is the wastewater containing solvents as degreasing agents; such wastewater should be considered hazardous waste unless sampling proves otherwise.

There may be additional requirements at contaminated job sites. See Section 2.3 and 2.4 for more waste management information. Contact staff of the WHMD at your local DEQ district office (see Appendix C) for questions in regard to evaluating wastes or other waste requirements that may apply.

Power Wash - More Information

For more information on power washing see the guidance document titled **"Mobile Power Washing"** which may be obtained via the DEQ's web site **www.michigan.gov/deq** (select "Key Topics," and "Publications" then search by keyword).

3.3.6 Programs that help fund the upgrade of wastewater systems

Grants, loans or other incentives may be available for design, construction or upgrades of wastewater treatment systems. There is often a lot of confusion when it comes to grant programs. Grant programs are often difficult to find and track. Funding requirements are often very specific to the type of business or organization that can be funded and the qualification

usually revolves around some type of long-term benefit to the population, a particular segment of the economy, green production, and the like.

Below are a few examples of grant programs currently available as well as some other non-traditional resources such as low interest loans and tax exemption programs. Most, but not all, of these programs are offered to encourage the consideration of energy production through wastewater treatment (have been awarded for the construction of technology such as anaerobic digesters) or to encourage pollution prevention.

Contact the agencies below for information on potential funding assistance available in Michigan:

- Part 37 of NREPA (Public Act 451 of 1994, as amended) allows for property, sales and use tax exemptions for industrial wastewater facilities installed primarily for control, capture and removal of industrial waste from the water. For an application packet long on to http://www.michigan.gov/documents/891_packet_94626_7.pdf. You may also contact Mr. Dave Porter 231-775-3960 ext 6261 to discuss the technical aspects of this program.

- MDA's Agricultural Innovation Grants **www.michigan.gov/mda** or call Mike DiBernardo 517-241-2178.

- USDA Renewable Energy and E2 Program **www.rurdev.usda.gov/rbs/farmbill** or call Rick Vanderbeek at 517-324-5218.

- MDEQ Pollution Prevention Small Business Loans call Karen Edlin at 800-662-9278 or edlink@michigan.gov.

- Department of Energy Loans for Projects that Employ Innovative Technologies in Support of the Advanced Energy Initiative **www.lgprogram.energy.gov** or contact **lgprogram@hq.doe.gov** or call 202-586-8336.

- Federal Alternative Energy Grants **www.grants.gov.**

- Public Act 550 of 2006 allows for property tax exemptions on anaerobic digesters and methane electric generating systems provided certain conditions are met. For information, contact the Michigan Department of Treasury **www.michigan.gov/treasury** or Michigan Department of Agriculture **www.michigan.gov/mda**

- The Michigan Small Business and Technology Development Center (877-873-4567, **www.gvsu.edu/misbtdc**) of the Michigan Economic Development Corporation can help small businesses (generally less than 500 employees) investigate financing options including Small Business Administration 504 loans.

- If you need help finding additional funding opportunities for anaerobic digesters or other wastewater systems that produce energy then contact Shauna Tonsor, Michigan Department of Labor and Economic Growth, Energy Office at 517-241-6223 or tonsors@michigan.gov.

3.4 Annual Wastewater Reporting

Part 31 of the Natural Resources and Environmental Protection Act (NREPA), Section 3111 requires a report be filed by every person doing business within this state who discharges wastewater either to the waters of the state or to a sewer system.

Annual Wastewater Reports (AWR) are due on August 1st for the previous reporting year. A copy of the revised administrative rules, wastewater report forms, instructions, and other related program information can be obtained at: **www.michigan.gov/deqannualwastewater**. You may obtain additional AWR information by contacting the Environmental Assistance Center at (800) 662-9278, or by calling James Baker, AWR manager, at (517) 373-2461.

3.4.1 What is an Annual Wastewater Report?

The Annual Wastewater Report requires all of the following information in detail:

- ✓ Name, location, and nature of the enterprise or operation.
- ✓ An estimate of the annual total number of gallons of wastewater discharged to the waters of the state or to any sewer system.
- ✓ Name of the waters of the state or sewer system into which the wastewater is discharged.
- ✓ An estimate of the annual amount of each critical material used in and incidental to manufacturing processes for those critical materials that exceed the annual usage threshold.
- ✓ An estimate of the annual amount of each critical material discharged to the waters of the state or to any sewer system.
- ✓ An estimate of the amount of critical materials discharged (in ranges of pounds) that were disposed of as a waste product or by-product and transferred to off-site locations.
- ✓ The signature of a senior management official or owner/operator certifying the form is true and accurate to the best of his/her knowledge.

3.4.2 What is an Abbreviated Wastewater Report?

An Abbreviated Wastewater Report may be filed if the discharge meets specific criteria. For the abbreviated report the filer needs only to fill out the first page of the Annual Wastewater Report. This page requires the following information:

- Business contacts and affiliations.
- An acknowledgement that the person meets the following conditions;

    1. has a discharge of wastewater to the waters of the state or to any sewer system;
    2. does not use critical materials in or incidental to the manufacturing processes in excess of the annual usage threshold; **and**
    3. does not discharge any amount of critical materials in their reportable wastewater discharge other than discharges exempted pursuant to Part 9 Administrative Rule R.299.9006 (3) or (4).

3.4.3 What Qualifies as Wastewater for AWR?

Wastewater means all liquid waste resulting from industrial or commercial processes including contact cooling and condensing waters, but excludes non-contact cooling water, sanitary sewage, and storm water run off that does not come in contact with process materials, products, or byproducts.

3.4.4 What is a Critical Material?

Under the revised AWR program there are 64 substances listed on Michigan's Critical Materials Registry. The criteria for choosing these chemicals was based on their toxicity, carcinogenic and bioaccumulative nature, and persistence in the environment. As identified in the register some compounds in addition to the listed critical materials are required to be reported under the AWR program.

3.5 Wastewater Treatment Operator Training and Certifications


State of Michigan
Department of Environmental Quality
This is to certify that
John H. Doe
Is qualified under the rules governing the certification of
Waste Treatment Plant Operators
to operate any
Industrial or Commercial treatment facility
of the classifications listed hereunder
Classification
A-1b, A-1f, B-2a, C-3a
Certificate Number W 0000
Expiration Date: July 1, 2012

Technical assistance, operator training and certification for wastewater treatment plant operators are offered by the Revolving Loan and Operator Certification Section, Environmental Science and Services Division, of DEQ. Industrial/commercial wastewater certification exams are offered once per year, usually in November. Certification is offered in a variety of classifications each relating to a unit process. Operator certifications required under Permit-by-Rule and the Storm Water from Industrial Activities General Permit are offered by the WB district offices (See Appendix C), usually on a monthly basis. More information on these programs can be found via the DEQ's web site **www.michigan.gov/degoperatortraining**.

3.6 Wastewater Treatment Technology

When a new facility is engaged in selection of wastewater treatment technologies applicable to their discharge or when the facility is upgrading or expanding their current wastewater system, the discussions with consultants and equipment vendors can be very technical and often confusing. This section is provided to help an owner or manager understand some of the treatment concepts and alternatives for various types of wastes. It is strongly recommended that a consultant be hired to help sort out the numerous alternatives and eliminate options that are not appropriate for the waste produced at your facility. If, during this process, you want to discuss the treatment selection or alternatives with the DEQ contact your NPDES or groundwater discharge compliance person in your WB District Office.

Food processing wastes are usually very specific to the facility. The generation of waste from different products varies widely due to the chemical composition of different commodities and the variety of methods used to process raw commodities into finished products.

Food processing facilities have many factors to consider in the selection of an optimum treatment system. The significance of the factors will be site specific. For example, one facility may have plenty of land available for land application or a lagoon system, whereas other processors may be limited in this regard. Other factors that may impact treatment selection include:

- Seasonality of discharge/operation
- Effluent discharge options and treatment requirements for each
- Volume of Discharge
- Range and strength of pollutant characteristics
- Climate conditions
- Skill of Personnel handling the waste and amount of time necessary to operate the treatment system
- Energy requirements
- Proximity to neighbors (noise & odors) & tolerance of staff
- Proximity to municipal POTW, ability to handle waste, surcharges
- Distance to available land, water and adequate soils
- Treatment efficiencies of various alternate treatment systems

As demonstrated above, there are many considerations for a food processor in selecting a proper waste handling system and many different systems to select from for their facility. Each issue is totally dependent upon the special characteristics of their facility, the products handled, and the type of processing. Therefore, a facility will benefit from discussions with an environmental engineering consulting firm to help them select the most economical way to manage their waste depending upon their specific circumstances.

The following sections are offered to assist facility owners that may be engaged in the evaluation of various treatment technologies and consultant selection.

3.6.1 Wastewater Characterization

The first thing a consultant will consider before designing a wastewater treatment system will be the characterization of the wastewater for each product and process. If different products are

processed at different times of the year the waste streams should be characterized separately. If there are widely different waste streams produced during the same season each waste stream should be characterized separately. Information about relevant food processing pollutant parameters along with some general terminology are set forth below.

Biochemical Oxygen Demand (Abbreviation: BOD; BOD_5). BOD indicates pollutant strength as a measured oxygen demand required to biologically break down a waste. It is calculated from a lab procedure measuring oxygen depletion in a sample over a five day period.

As the term Biochemical Oxygen Demand implies, many of the components of wastewater cause an oxygen demand to occur within the wastewater treatment system or in the receiving stream. This demand results as microorganisms, mainly bacteria, feed on the pollutants in the wastewater. As bacteria metabolize the pollutants they require oxygen, and dissolved oxygen is taken from the wastewater. As the BOD load increases, the amount of oxygen required to consume the pollutants increases. Also as the term "**Biochemical** Oxygen Demand" implies, most of the demand occurs as a result of biological (organic) pollutants, but some inorganic pollutants such as ammonia can also contribute to the oxygen demand. As ammonia is biologically oxidized to nitrate (nitrification), oxygen is consumed. **Total BOD** is the sum of the **carbonaceous oxygen demand (CBOD)** and the **nitrogenous oxygen demand (NOD).**

Simply put, this test shows how much oxygen bacteria will use to decompose whatever is in the water. Common sources of BOD from food processing are vegetable and fruit remnants and sugars that may be added or leached from fruit during the process. Dissolved sugars are in both raw wastewater and filtered wastewater.

In the laboratory, the BOD of a wastewater is determined by diluting a portion of the wastewater sample with bacteria and nutrient-rich, pH buffered dilution water in a 300 milliliter (ml) BOD bottle. The initial dissolved oxygen (DO) concentration of the diluted sample is determined and the bottle is incubated at 20°C for 5 days. The final DO in the bottle is determined and the BOD of the sample is calculated based on the bacterial oxygen depletion and the amount of sample dilution. If only the CBOD of the wastewater is to be determined, a **nitrification inhibitor** is added to the BOD bottle during dilution.

Chemical Oxygen Demand (COD) is also a measurement of pollutant strength. However, with COD a strong chemical oxidizing agent is used to cause the oxygen demand. The test will measure both what can be biodegraded by bacteria and other pollutants that can be degraded by the chemical oxidant *(not necessarily toxic to bacteria)*. COD is generally higher than BOD but may be correlated to it for a particular wastewater. The advantage of the COD test is that it takes only 3 hours to get results, while a BOD test is conducted over a period of 5 days.

Solids (TSS are Total Suspended Solids, TDS are Total Dissolved Solids)
Components in wastewater may be classified in several different ways. One might refer to the pollutants in wastewater as being either **inorganic** or **organic**. Inorganic materials include sand, grit, minerals and metals, and are not biodegradable. Organic materials can be thought of as those which contain carbon, originate from living plants and animals, and are usable as a food source by living organisms. Obviously, this is an over-simplification since organic substances may be synthesized commercially, and many of these compounds may not be biodegradable. Examples of organic pollutants include animal wastes, food processing, household wastes, and oil and grease.

Solids are present in nearly every wastewater, may be very detrimental environmentally, and so are very often regulated in discharges of wastewater. Solids increase the amount of sedimentation in aquatic systems, choking off plants and animals, and limiting the use of the receiving water. The term "solids" actually includes several possible components. The term "**suspended solids**" refers to particles which may be visible, add turbidity, and may be filtered from water. "**Dissolved solids**" are those which pass through a filter and are not seen. Only when the water is evaporated is the amount of dissolved material apparent. So "**total solids**" refers to the amount of material that would be recovered if the water was evaporated from a sample, including particulates and dissolved materials.

The term "**settleable solids**" refers to those particulates which will settle within a defined period of time under quiescent conditions. Although no longer typically used for wastewater discharge monitoring, the settleability test is often used in controlling biological wastewater treatment plant operations, especially the activated sludge process. Another solids term that is often used is "**colloidal solids**". This refers to particles which are so small that they will not settle. These may pass through a filter paper and give the water a hazy appearance.

Solids may be organic or inorganic. For example, table salt in water would be an inorganic, dissolved solid. Pepper in water would be an organic, suspended solid. The fraction of organic solids is often estimated by burning the material. Organic materials will burn or "volatilize" at a temperature of 550°C, while inorganic materials will remain as a residue and are referred to as "fixed" or "ash." Solid organic matter in wastewater may be food remnants that are washed into water. Solids that are suspended in water (TSS) may settle out, while dissolved solids (TDS) will not settle.

It is important to note that the fraction of organic solids which are dissolved in wastewater may change. As wastewater ages solids tend to dissolve reducing suspended solids and increasing dissolved solids. Stale wastewater is more difficult to treat because fewer pollutants can be removed by simple settling. The increase in dissolved solids requires longer detention times, reducing the efficiency of a biological wastewater treatment process. Thus, it is important to keep wastewater fresh by limiting detention time of the wastewater in the collection system, equalization tanks, etc.

Solids often must be removed after a water treatment processes. After anaerobic (without oxygen) or aerobic (with oxygen) treatment, the dead bacteria form sludge that needs to be removed before discharge. After chemical addition, i.e. to remove phosphorus, precipitated solids must also be removed. For phosphorus removal chemical is added to change phosphorus from a dissolved state into a phosphorus particle. These solids may be removed by settling or filtration.

Chloride (Chemical symbol Cl)
Very high chloride levels are found in cherry brine waste. Chloride may also be present in wastewater due to water softener backwash and salt that is added as a seasoning or preservative for fruits and vegetables. The only known way to remove salts (sodium, chloride and others) is through reverse osmosis and other micro-filtration technologies. Microfiltration is extremely expensive and impractical, especially if the water also contains BOD and other solids that will clog the filters. The energy requirements of microfiltration are also high. Salts are generally toxic to plants and aquatic organisms at high concentrations. Chloride limits in groundwater are based on the concern for acceptable tasting drinking water. Chlorides are often treated through dilution with other cleaner water to bring the concentration down to acceptable levels.

Sodium (Symbol Na)
Sodium often accompanies chloride, although there are other types of salt such as magnesium chloride. Sodium limits in groundwater are based on the health effects of sodium to people, especially those who may have restricted diets due to high blood pressure.

Sulfur compounds- (symbol S, Bisulfite, Sulfate, sulfur dioxide, hydrogen sulfide)
Sulfur is a common preservative for fruit. Bisulfite is a common constituent of cherry brine. Sulfur by itself is not toxic, but under anaerobic conditions sulfur dioxide and hydrogen sulfide may form. These compounds are regulated air pollutants because of their hazard to health and their effect on people with certain sensitivities such as asthma. The formation of these compounds also leads to intolerable odors. Maintaining aerobic conditions and alkaline pH adjustment are two options that will help prevent sulfur compounds from turning into hydrogen sulfide and sulfur dioxide.

Nitrogen compounds (ammonia - NH3, nitrate - NO3, nitrite - NO2, Total Inorganic Nitrogen ammonia nitrogen plus nitrate nitrogen plus nitrite nitrogen - TIN)
Nitrogen and phosphorus are nutrients that are required by every living organism, becoming a component of every cell. Domestic wastes, animal wastes, food processing wastes, and many industrial wastes will contain these nutrients. If these are discharged into a stream or lake they act as fertilizer, increasing the growth rate of aquatic plants. Careful control of the nutrient load discharged into the environment is necessary to protect waters of the state.

Nitrogen may be a concern for environmental reasons as well as for public heath reasons, depending on the form or compound that the nitrogen is in. For instance, ammonia (NH_3) is often limited in surface water discharge permits due to its toxicity to aquatic organisms, and because it causes an oxygen demand in water. Ammonia, nitrite and nitrate are fertilizers, increasing the growth rate of weeds in rivers and lakes. Total Inorganic Nitrogen is limited in discharges to groundwater because it will form nitrate which can interfere with the respiration process in infants, causing a serious health condition known as “blue baby syndrome” or methemoglobinemia.

Some types of bacteria used in wastewater treatment require a certain amount of nitrogen to form a healthy population to biologically stabilize wastewater; nitrogen compounds serve as nutrients for bacteria. Food processing wastewater is often deficient in nitrogen compounds. Food processors may need to add nitrogen to maintain a bacteria population in wastewater to reduce BOD but then treat the water a second time to remove nitrate. Nitrogen compounds are treated through controlled aerobic and then anoxic processes, by nitrification and denitrification, or by land application to a crop that removes nitrogen as a plant nutrient.

Keep in mind that as organic pollutants are broken down by bacteria in the biological treatment process, nitrogen is released in the form of ammonia. At the same time the biomass is growing and taking up nitrogen; although the biomass typically does not remove enough nitrogen to meet discharge permit limits for ammonia, biomass uptake does account for some nitrogen removal.

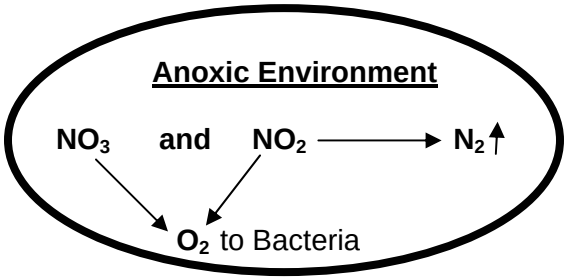
Nitrification is a biological process that may occur in wastewater treatment plants. Bacteria can utilize inorganic compounds (like ammonia) as an energy source, using carbon dioxide (or bicarbonate) as a carbon source to build cells.

Two types of bacteria are involved in the nitrification process: Nitrosomonas oxidize ammonia to nitrite, and then Nitrobacter oxidize nitrite to nitrate.

$$NH_3 \xrightarrow{\text{Nitrosomonas}} NO_2 \xrightarrow{\text{Nitrobacter}} NO_3$$

In facilities where nitrification is required to reduce the concentration of ammonia in the effluent, the objective is to provide conditions in the treatment system for these bacteria. In some treatment plants this occurs almost automatically due to system design (such as in an extended aeration process), while it may be more of a challenge in others. The result of the nitrification process is that ammonia is oxidized to the nitrate.

Denitrification is the reduction of nitrate and nitrite, to nitrogen gas by bacteria stripping the oxygen from the nitrate and nitrite.



As indicated above, in an anoxic environment (no dissolved oxygen, but nitrate is present) bacteria are able to use oxygen from nitrate and nitrite, releasing nitrogen gas.

Denitrification is required where nitrate or nitrite is a concern in the discharge. In situations in which the wastewater treatment plant discharges effluent into groundwater, a groundwater discharge permit is required. This permit usually limits the Total Inorganic Nitrogen (TIN) (NH_3-N + NO_2-N + NO_3-N) in the discharge to 5 mg/L maximum. The facility must be capable of first nitrifying the ammonia to nitrate, and then denitrifying the nitrate to nitrogen gas.

Phosphorus (P) Phosphorus is also a nutrient.
Phosphorus (P) is regulated in wastewater discharged to surface water due to its properties as a fertilizer. Living organisms take up carbon, nitrogen and phosphorus approximately according to the 100C:5N:1P ratio. Phosphorus is one of the essential nutrients needed to build cells and sustain life. Plants do not grow where there is not an adequate supply of P. P can serve as the limiting nutrient that encourages algae blooms and other aquatic plant growth.

Phosphorus can be found in cleaners and is also produced from decaying fruit and vegetable matter. Some Phosphorus removal is possible with bacterial processes. Higher removal rates require chemical addition and settling for removal. Phosphorus can also removed by adsorption to soil or special sands, and by filters.

Ethylenediaminetetraacetic acid (EDTA)
EDTA is mentioned here because it has been found to exacerbate metals leaching when water containing EDTA is applied to soils. EDTA is used as a boiler additive and is commonly found in cleaners and as a preservative. EDTA complicates wastewater treatment processes because it chelates metals (mobilizes them). It is suspected that where high BOD wastewater is leaching

metals such as iron and manganese from soil, EDTA may further leach nickel, cobalt and other more toxic metals. Perhaps, the only way to deal with EDTA is to keep it out of the wastewater; there is no known treatment.

Low or high pH
pH is an indication of acidity or alkalinity of water. A pH value below 7 is acidic, above 7 is basic, and 7 is neutral. pH is determined by measuring the hydrogen ion concentration in water. A neutral pH is desirable for wastewater treatment because the bacteria that will treat wastewater in an aerobic environment require a more neutral pH environment to live. Aerobic bacteria and nitrifying bacteria prefer neutral to slightly basic range (7-9). Anaerobic bacteria do well in a slightly acidic and neutral range (6.5-7.5). Odor producing bacteria that form hydrogen sulfide will be eliminated at a pH of 8, but may thrive at a pH of 7. pH is also important in precipitation reactions.

3.6.2 Potential Permit Limitations

The next major consideration for the consultant in planning a treatment system will be the potential permit limitations that will be applied to the various pollutants, as determined by the discharge type and location. Permit limitations are site specific and depend upon characteristics of the receiving waters (such as cold water versus warm water streams, stream flow rate, effluent discharge rate, and geology and other site characteristics for groundwater discharges.

Limitations in surface water discharge permits (NPDES) are based upon the more stringent of treatment technology based effluent limitations (TTBELs) and water quality based effluent limitations (WQBELS). TTBELs are established by the Environmental Protection Agency (EPA) to set minimum standards for various treatment technologies. WQBELS are treatment levels necessary to protect aquatic life and designated uses of the waterway.

Ground water discharge permits limitations are based upon groundwater discharge standards described in the Part 22 Rules, and compliance with those standards is measured in groundwater. Effluent limitations in groundwater discharge permits are to ensure the standards are being met in groundwater.

BOD
NPDES: For the fruit and vegetable sector, BOD is often limited through TTBELS listed in 40 CFR 407, Canned and Preserved Fruit and Vegetable Processing Point Source Category. Tables within this federal regulation provide the BOD limitation based upon the amount of raw material processed and type fruit and vegetable – see table below for example. However, WQBEL BOD limitations may apply to the discharge based upon the dissolved oxygen standards of the receiving stream (i.e. coldwater versus warm water).

Groundwater Discharge: There is no specific limit in the Part 22 Rules for BOD. However, Rule 2204(2)(f) states that a discharge cannot create a facility as defined by Part 201 of Act 451. Based on Department experience, the current permit limitations for BOD are 45 mg/l as a daily maximum and 30 mg/l as a monthly average.

[Metric units, kg/kkg of raw material; English units, lb/1,000 lb of raw material]

Commodity (vegetables)	BOD5 effluent limitations: Maximum for any 1 day	BOD5 effluent limitations: Average of daily values for 30 consecutive days shall not exceed	BOD5 effluent limitations: Annual average shall not exceed
Beets	1.01	0.71	0.57
Broccoli	3.83	2.21	1.47
Carrots	1.76	1.11	0.82
Corn:			
Canned	0.71	0.48	0.38
Frozen	1.45	0.84	0.56
Dehydrated onion/garlic	2.45	1.46	0.98
Dehydrated vegetables	2.98	1.76	1.21
Dry beans	2.50	1.51	1.07
Lima beans	3.68	2.19	1.51
Mushrooms	3.01	1.78	1.22
Onions (canned)	3.09	1.83	1.25
Peas	2.42	1.50	1.08
Sauerkraut:			
Canning	0.50	0.30	0.21
Cutting	0.08	0.05	0.04
Snap beans	1.51	0.87	0.58
Spinach	2.37	1.36	0.91
Squash	0.90	0.59	0.46
Potatoes	0.90	0.66	0.55

Sample Table for Vegetables from 40 CFR 407, another table is available for Fruits

Dissolved Oxygen (DO)
NPDES: Depending upon the receiving water categorization (warm versus cold water or Great Lakes), type and size as compared to the quantity of discharge, the effluent DO may be limited (Cold Water 4 to 8 mg/l; Warm Water 3 to 6 mg/l).

Groundwater Discharge: There are no groundwater standards for dissolved oxygen. It is recommended that lagoons maintain a DO of at least 2.0 mg/l to prevent odors. In groundwater, the concentration of DO may be an indicator of the potential for solubilizing metals in groundwater.

Nitrogen Compounds
NPDES: For surface water discharge, ammonia is often limited because it is chronically toxic to fish (limits are expressed as a 30-day average) and can impact dissolved oxygen (limits expressed as a daily maximum). Ammonia limits can range from .5 mg/l to 30 mg/l.

Groundwater Discharge: The Nitrogen standard for groundwater is expressed as Total Inorganic Nitrogen (TIN), and is the sum of nitrate, nitrite and ammonia, as nitrogen. The standard in groundwater is 5.0 mg/l for total inorganic nitrogen, with a nitrite limitation of 0.5 mg/l. Effluent limitations may be based on whether additional treatment, such as crop uptake, takes place after discharge of wastewater to the land.

Solids
NPDES: The TTBEL for Total Suspended Solids (TSS) are identified in 40 CFR 407 (in the same manner as BOD).

Total Dissolved Solids are often based on the WQBELs, which would apply to sulfur compounds and chlorides. The TDS WQBEL is based upon the ratio of the receiving water flow to the rate of the discharge. After mixing, the in-stream concentration will be based upon meeting concentrations of 500 mg/l as a monthly average and 750 mg/l as a daily maximum.

Groundwater Discharge: There are no standards in groundwater for TDS.

Phosphorus
NPDES: Phosphorus discharges in NPDES are based upon the WQBELS, which establish a 1 mg/l limitation to all point sources discharges. The water quality standards also establish a standard for the prevention of aquatic nuisance growth conditions. Therefore, if the receiving water or an impoundment downstream is or may be impacted by nuisance aquatic plant growth, the limitations can be further restricted. It is useful to review the list of water bodies that are not attaining water quality standards, to see if the proposed receiving water is subject to a phosphorus reductions strategy/study (sometimes called a "total maximum daily load").

Groundwater Discharge: The groundwater standard for phosphorus is either 1.0 mg/l if the discharge is located greater than 1,000 feet hydraulically upgradient from a surface water body, or a standard established by the Surface Water Assessment Section that is protective of surface water, pursuant to R 323.1041 through R 323.1117, if the discharge is less than 1,000 feet hydraulically upgradient of a surface water body. The effluent limitation is determined on the ability of the soils to remove phosphorus through mechanical adsorption, but cannot exceed 5.0 mg/l.

pH
NPDES: The WQBEL, 6.5 to 9, is often more restrictive and the basis for the permit limitation.

Groundwater Discharge: The groundwater limitation for pH is 6.5-9.0.

3.6.3 Pollution Prevention/Source Reduction

The first treatment best considered by food processors is source reduction and recycling. Keeping fruit and vegetable pulp out of water, careful use of chemicals, containment of spills and so forth will reduce water treatment cost and save money on material that is purchased for production. The more water sent down the drain means the more water that must be treated and the larger wastewater treatment plant built.

The plant production manager is in the best position to come up with creative methods to reduce water and keep solids, salts, detergents and other polluting substances out of the water if they are challenged with the task. In addition to saving money through lower water treatment costs, careful management of food additives will save the cost of what is purchased and wasted. The facility could investigate and employ various techniques to reduce in-plant waste during the following activities:

- Harvesting-Transportation practices
- Receiving, Washing and Sorting practices
- In plant transport
- Peeling operations
- Size reduction (pitting and coring, slicing etc.)
- Blanching (according to USEPA, this is one area where a considerable amount of the waste is generated; considerable research has been done on alternate methods of blanching to minimize the waste generated).
- Preservation

Consider common source reduction strategies, which include:

- Reuse of water such as cooling water and an examination of all food processes.
- Water is often used to transport the product from one production area to another. Consider the use of conveyors for this purpose.
- Fruit and vegetable pulp waste should be handled as a solid and not washed into water.
- Hoses used to wash down equipment should have trigger spray nozzles and appropriate pressure to maximize effectiveness. Adjust or replace pump and dry feed systems to reduce loss of material.
- Consider heat exchangers to use excess heat

- Minimize losses with secondary containment systems, drip pans etc.
- Shade cooling pads, and
- Use on/off washing rather than continuous spray to save on water use.

Finally, refer to Chapter 10 to learn more about Pollution Prevention Programs and resources offered by the DEQ.

3.6.4 Wastewater Treatment Processes

Wastewater treatment processes may be grouped into three general categories, **physical, chemical** and **biological**. Physical processes include screening, sedimentation (gravity settling) and filtration; whereas chemical treatment processes include precipitation, and chemical destruct systems.

The third category, **biological**, includes processes which rely on living organisms to remove pollutants from the wastewater. This includes processes such as waste stabilization lagoons, trickling filters, rotating biological contactors, and activated sludge.

In most cases wastewater treatment is accomplished through the use of a combination of physical, chemical and biological treatment processes. Sometimes these combinations are called "treatment trains." For instance, a typical treatment plant might include preliminary treatment (physical) to remove large debris and grit, primary treatment (physical) to remove settleable suspended solids, secondary treatment (biological) to remove the remaining particulates and dissolved organic material, chemical precipitation to remove phosphorus, and finally tertiary filtration (physical) to remove remaining fine particulates.

3.6.4.a General Discussion of Biological Treatment Processes

Biological wastewater treatment processes may be divided into two main categories, suspended growth and attached growth. Suspended growth processes are those in which bacteria and other microorganisms are suspended or mixed in the wastewater being treated. Following treatment, this biomass is separated from the suspension, and the clear water is discharged.

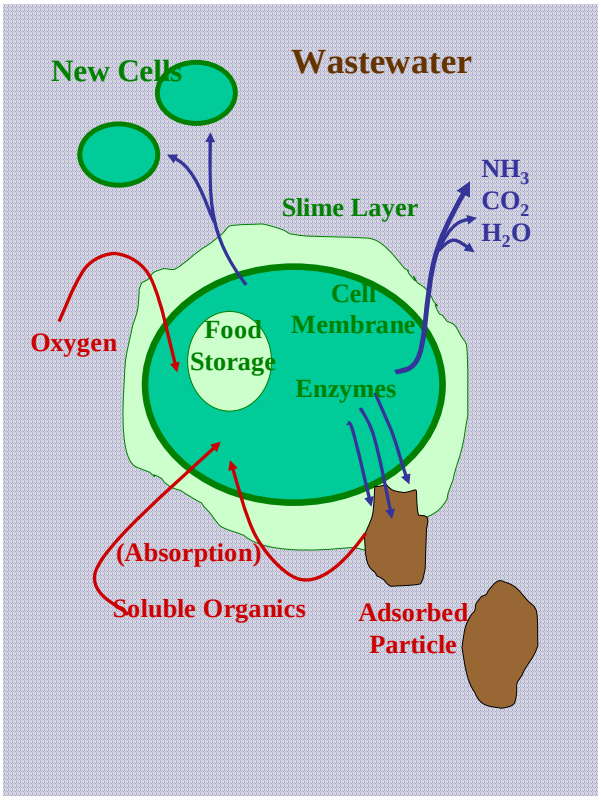
Attached growth processes are those in which the microorganisms grow on an inert media, typically plastic. Trickling filters and rotating biological contactors are the most common attached growth systems.

When working with biological wastewater treatment processes, understanding some basic biology will be needed. Some terms that will be used in this discussion and definitions follow:

Anaerobic	Organisms that need no dissolved oxygen (DO) or nitrate (NO_3) oxygen
Aerobic	Organisms that must have DO
Facultative	Organisms that can exist with or without DO

Heterotrophic	Organisms which consume organics in the wastewater
Autotrophic	Organisms which are able to use inorganic compounds as an energy source, such as nitrogen

Bacterial Cells



It is helpful to understand a little about the bacterial cell if we wish to know how it is able to remove pollutants. The diagram at the right shows a typical cell. The inside of the cell contains reproductive information, food storage mechanisms, etc. Surrounding the cell is a membrane which keeps the organism together, and through which dissolved food may pass. The cell wall is coated with a slime layer which is used to trap particles.

The diagram at the left shows a bacterial cell suspended in wastewater containing both soluble and particulate organic pollutants. Soluble organic pollutants pass through the cell membrane (**absorption**) and are used as a direct food source. Particulate organics cannot pass through the membrane, but stick to the slime layer (**adsorption**). The organism begins to produce enzymes which are secreted through the membrane to solubilize the particulate, allowing its dissolved components to pass through the membrane and be used as food. In this way the organism is able to remove both soluble and particulate organics from the wastewater.

Nutrient Deficient Wastes

Living organisms need certain nutrients in addition to carbon to live and grow. Two nutrients which are of particular concern in wastes which are high in carbon (BOD) are nitrogen and phosphorus. Wastes are considered “nutrient deficient” for biological wastewater treatment systems if the amount of nitrogen and/or phosphorus are not in correct proportion to the amount of BOD that must be removed. That ratio generally taken is 100 parts carbon (or BOD) to 5 parts nitrogen, to 1 part phosphorus. Wastes that vary significantly from that proportion will be difficult to treat, and will probably require the addition of the nutrient which is lacking.

3.6.4.b Physical Treatment Technologies

3.6.4.b.1 Screening, Grinding, Grit Removal

Preliminary treatment is intended to protect downstream processes by removing large debris that might plug or jam equipment. It also is an efficient and economical way to reduce the amount of pollutant load on downstream wastewater treatment processes, allowing for smaller design and reduced treatment costs.

Removal of large particles (over ¼ inch) often is accomplished through the use of bar screens. Coarse bar screens are usually inclined in the flow with the bars spaced about 1½ inches apart. The screen may be manually cleaned in smaller facilities or mechanically cleaned automatically in larger facilities. Other bar screens have found increased use in recent years. Often these screens are designed to remove particles as small as ¼ inch, obviously removing a larger amount of material from the wastewater flow, and providing increased protection for downstream processes. Some facilities may need pre-filtering or fine screening before further treatment. One option for this is a hydrosieve unit which removes larger particles of food (cherry pits, leaves, apple peels, etc.). The remaining wastewater passes into the treatment process.

Grinding and shredding mechanisms such as comminuters have been used for many years to reduce the size of large debris, sending the shredded debris further into the treatment process. Although more modern equipment may be more efficient and less maintenance intensive than the older comminuters, they still deposit the debris back into the wastewater flow where it must be treated again later (an advantage that the fine screen has over grinders). Equipment is also available which first shreds the large particles, and then removes this material on a screen, reducing the volume of the material which has been removed.

Screening or grinding may be followed by grit removal. Grit includes mainly the heavy inorganic materials such as sand, gravel, etc. that are abrasive to pumps, accumulating in primary and secondary treatment processes, and adding unwanted inorganic content to sludge.

There are several options for grit removal, but the two most common methods are gravity grit separators and aerated grit separators. Gravity separators simply regulate the flow velocity so the grit will settle out of the flow, but the organic material will remain suspended; this targeted velocity is generally taken as 1 foot per second. The simplest of the gravity separators is a channel in which the velocity is controlled, with the grit being removed manually. Another type of gravity separator is the detritor process which includes a settling tank (often rectangular) with a mixer that keep organics in suspension and a plow or rake that pulls the grit up an inclined ramp to a dumpster.

Aerated grit chambers operate along the same principle as the gravity separators, except that rather than adjusting the flow velocity through a channel, air is injected near the floor of the separator. The air causes enough turbulence in the tank to keep the organics in suspension while allowing the grit to settle. Often air lift pumps are used to remove the grit from the separator.

3.6.4.b.2 Clarification

Clarification is process of settling solids out of wastewater, and is often used in two locations in the treatment; primary clarification is for solids removal of the raw wastewater and secondary clarification is used to remove biological solids after biological treatment. Primary clarification is not often employed at food processing facilities possibly because raw food solids do not settle well, or that long detention times could cause the wastewater to go anaerobic.

3.6.4.b.3 Dissolved Air Flotation (DAF)

For some wastes a DAF unit is an efficient and cost effective way to reduce TSS. A DAF unit includes a tank with equipment to remove solids from the top for floating solids. Air is injected into a side stream of water at high pressure. The high pressure causes the air to dissolve into the water. Next, the high air content water is injected into the tank. The air comes out of solution just like when you open a soda bottle. The air bubbles form around any suspended particles and float them to the surface. A scraper at the water surface collects the particles and scrapes them into a trough at the end of the tank. Some units are rated to over 90% efficiency. By removing solids before other treatment the downstream treatment units could be much smaller and less expensive to build and operate.

A disadvantage to a DAF process is that it only removes particles (solids). It does not remove dissolved waste. Another issue is solids removed by the DAF are a solid waste pursuant to Part 115 of NREPA, and can only be land applied under an Agricultural Use Exemption approved through WHMD. Solids removed by screening are exempted under Part 115 by the legislature, and no authorization is required to land apply screening wastes.

3.6.4.b.4 Activated Carbon Treatment

Activated Carbon is a very porous powder or granular material that has an amazing amount of surface area per volume, some carbons as high as 20,000 square feet per gram. This high surface area and carbon's strong attraction for organics makes this technology excellent for removing dissolved oil and solvent components from water. This technology removes things that will adsorb to or be trapped by carbon's pores and surface area. Many pollutants do not adsorb to carbon like salts, acids, nitrates, etc. so the technology is not very useful for food processing.

3.6.4.b.5 Evaporation and Distillation

Some facilities use these technologies to concentrate sugars for reuse. One drawback is that it uses a lot of energy.

3.6.4.c Chemical Treatment Technologies

3.6.4.c.1 pH Control Systems

Some processing may require that produce be modified or preserved with at high acid or basic treatment. Waste from such operations will need to be neutralized to an acceptable pH before discharge (normally between 6.5 and 9). The pH of the wastewater can be neutralized by adding an acid to a high pH (basic) waste and a base to a low pH (acidic) waste. pH control may also be important in conjunction with other treatment processes.

3.6.4.c.2 Precipitation

This process involves adding a chemical or adjusting pH to convert dissolved wastes in the water to form a solid particle. This process is effective for removing phosphorus and many dissolved metals. Clarification or a DAF unit often follows precipitation to remove the particulate generated during precipitation

3.6.4.c.3 Phosphorus Removal – Chemical Precipitation

The most commonly used method of phosphorus (P) removal is by precipitation with a metal salt. Aluminum or iron salts are added which will combine with soluable P to form a particle which that is heavier than water. The metal salt-phosphorus sludge is then removed from the wastewater by clarification or filtration

3.6.4.d Biological Treatment Technologies

3.6.4.d.1 Facultative Lagoons (non-aerated)

Facultative lagoons rely on anaerobic bacteria to break down high strength wastes. They require long holding times and frequent cleaning. The major problem with this technology is the odor produced in facultative ponds. Offensive odors can often be identified for miles down wind of the lagoon.

3.6.4.d.2 Aerated Lagoons

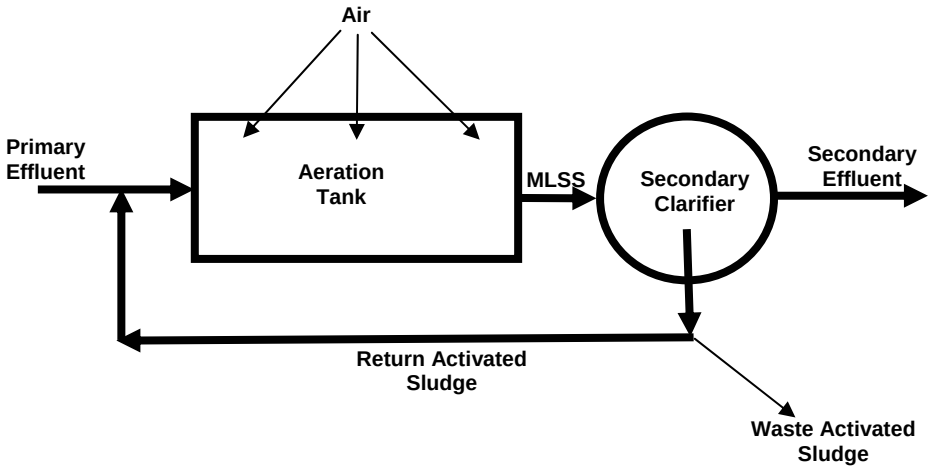
Aerated lagoons require a great deal of energy to treat high BOD food processing waste. If the aeration system is not large enough or the waste load is not managed to the capacity of the aeration system the lagoons will be overwhelmed by the BOD and go anaerobic. Because lagoons are open to the air any odors produced will quickly spread downwind. Aerated lagoons may be better suited for low strength BOD wastewater treatment.

Some sludges are generated at the bottom of lagoons, and they will need to be removed and land applied occasionally. Lagoons require significant amounts of land and do not efficiently remove solids from some wastewaters

3.6.4.d.3 Activated Sludge

The Activated Sludge Process is a process where organic pollutants in the waste are used as a food source by a culture of microorganisms in an aeration tank. The culture is suspended in the wastewater by air bubbled through the waste and culture.

The activated sludge process relies on the cultivation of a population of millions of microorganisms of many different types, mostly aerobic and facultative heterotrophic bacteria suspended in the wastewater,. The suspension of microorganisms in wastewater, referred to as



mixed liquor (or **Mixed Liquor Suspended Solids, MLSS**)**,** is supplied with oxygen and kept in suspension by bubbling air through it. This air is supplied by compressors (blowers) through air diffusers at the bottom of the aeration tank. As the organisms feed on the organic pollutants (BOD) in the wastewater, the pollutants are converted to more organisms (biomass) and some byproducts. The amount of biomass produced is often estimated as about 0.7 pounds for each pound of BOD removed in the secondary process. While an individual bacterium is not visible to the eye, they stick to one another to form a biological mass which may be easily seen as brown colored clumps known as floc.

Following an adequate amount of treatment time in the aeration tanks the mixed liquor flows to the secondary clarifiers where the biomass floc is allowed to settle out of the wastewater. The wastewater passes to the next treatment step, and the settled biomass is returned to the aeration tanks to provide organisms for continued removal of pollutants. This returned biomass is referred to as **Return Activated Sludge (RAS)**.

Since this is a living and growing process, it will continue to build biomass to the point of having too much. The amount of biomass in the process is controlled by removing (wasting) a portion of it each day. This excess biomass removed is known as **Waste Activated Sludge (WAS)**.

The activated sludge process is capable of producing a high quality effluent, and if properly designed can treat a wide range of flows with a fairly wide range of organic loading. With some changes in design and operation the activated sludge process can be used for nitrification and denitrification..

The activated sludge process will require the close attention of personnel who have mechanical ability, understand chemical and biological principles, and who in most cases must be able to perform laboratory work necessary for efficient operation and to determine the health of the

system. The process is energy intensive, but that is somewhat dependant on the specific design configuration.

High BOD can cause odors if all of the dissolved oxygen is consumed by bacteria. If the wastewater lacks nutrients, they must be added. Other disadvantages to this technology are the high cost of the treatment plant, on-going energy costs, and the need for a highly trained qualified operator.

There are several modifications of the activated sludge process that may be appropriate for treating food processing wastes including:

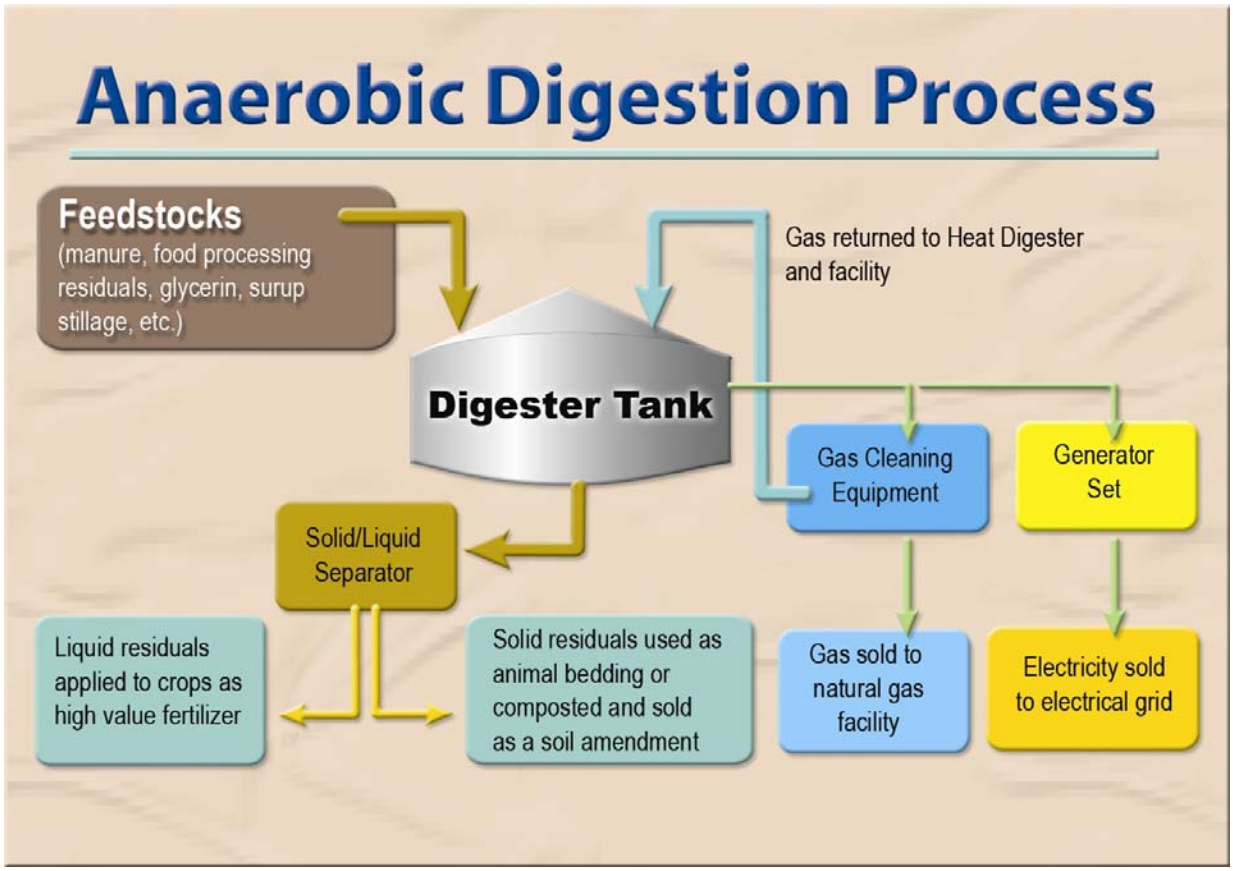
- Extended aeration such as an oxidation ditch: This modification can provide resistance to upset and enables the production of a high quality effluent under varying load conditions.
- Sequencing Batch Reactors eliminate the need for the secondary clarifier and return sludge system (it has a capital and operational cost advantage). This modification also provides a smaller footprint than other activated sludge designs.
- Membrane Bioreactors (MBR) is an activated sludge process where the treated water is pulled through ultrafiltration either by vacuum or gravity (avoiding the need for a final clarifier). MBR has the ability to provide excellent treatment due to the filtration component of this process, but has the disadvantage of high construction and operation costs.

3.6.4.d.4 Attached Growth/Fixed Film Processes

Attached growth processes (also known as fixed film or biological filters) treat wastewater by sprinkling wastewater over a bacterial culture that is growing on inert media (usually plastic), rather than the bacteria being suspended in the wastewater as they are in the activated sludge process. This "film" of organisms attached to the media feed on organic materials such as sugars and other nutrients as the wastewater flows through the media. There are several different configurations of the attached growth process; in the Trickling Filter the media is stationary and the water is distributed over it, whereas in the Rotating Biological Contactor the media is in the form of partially submerged discs which rotate on a horizontal shaft. The Moving Bed Bioreactor is an activated sludge modification with plastic media either fixed in the aeration tank, or mixed through the reactor, taking advantage of both the suspended growth and attached growth processes. Since bits of biomass are continually "sloughed" from the media, attached growth processes must be followed by solids removal.

3.6.4.d.5 Anaerobic Digesters

Anaerobic processes use bacteria that live without oxygen to biodegrade sugars and nutrients. Without sufficient oxygen high BOD water goes anaerobic. However, for efficient digestion oxygen must be excluded. A high degree of control is required for effective treatment. Since food processing waste is usually nutrient deficient nitrogen and phosphorus may need to be added for efficient biodegradation of sugars. Methane gas is produced by anaerobic digesters, and some operations utilize the gas for heating or electric generation.



Anaerobic Digestion Process with potential pollution prevention opportunities.

3.6.4.d.6 Fermentation

Fermentation is used to treat simple sugars. The advantage is that fermentation of sugar can produce an alcohol that may be used in energy production. Fermentation is an anaerobic process that may require prior treatment for sulfites and controlled pH.

3.6.5 Final Wastewater Disposal

3.6.5.a Land Application

A significant issue with applying high BOD waste to the land is that it will cause the mobilization of naturally occurring metals in the soil which may result in dissolved metal plumes in the groundwater. This is caused by certain soil bacteria which strip oxygen from metal oxides once the free oxygen in the saturated soil is depleted, releasing metal ions. Studies to determine what amount of BOD (both mg/l concentration and pound per acre per day loading) that can safely be land applied are under way. You can learn more about this project from Michigan State University's website: http://www.egr.msu.edu/%7Esafferma/Research/Greeen/greeen.html. A recently public noticed groundwater discharge permit for a food processor discharging to Rapid

Infiltration Basins (RIB) had a BOD limit of 70 mg/l. In order reduce the BOD in wastewater, a biological treatment process is needed.

Land application uses biology in the soil for treatment, and therefore, like other biological treatment needs a proper nutrient balance. Often nitrogen and phosphorus need to be added to food processing wastewater. A neutral pH (6 – 9) is also required, and pH adjustment may be required. Problems can also occur when a facility processes a constantly changing variety of items. Different bacteria may be more effective on different waste streams. By changing waste streams often, the biology has a difficult time acclimating and treating the wastewater effectively.

Irrigation during the winter months has potential problems related to both treatment and runoff. Irrigation rates are controlled by the groundwater discharge permit, which are established in order to provide the necessary residence time in the soil to accomplish treatment for BOD, phosphorus and nitrogen, if necessary. For BOD in particular, residence time and aerobic conditions are critical to allow the soil bacteria to break down the BOD. The aerobic bacteria activity is also severely limited during the winter due to colder temperatures in the soil.

During the winter the wastewater can freeze at the soil surface, and then melt rapidly during both winter thaws and in the spring. This creates potential problems with ponding at the ground surface and runoff from the irrigation field, affecting the discharge rate of the wastewater to the soil that is required for treatment. The department strongly recommends that wastewater not be discharged in winter through the use of spray irrigation.

See Section 2.2.1 for land application requirements overseen by the WHMD.

3.6.5.b Rapid Infiltration Basins (RIB)

In order to use RIBs, the wastewater needs to be treated to meet the groundwater discharge standards in the Part 22 Rules. BOD and TSS need to be low in order to prevent clogging on the soil surface. The advantage over irrigation is less land is required as the application rate is higher.

3.6.5.c Irrigation

Irrigation is the use of plants, soil and soil bacteria to further treat the wastewater before it reaches the groundwater. Nitrogen, phosphorus, BOD and TSS can be reduced. The water, nitrogen and phosphorus can be beneficial to the crops being grown. The main disadvantage is the amount of land required and the fact that it is only effective during the growing season.

3.6.5.d NPDES Discharge

Discharges to a surface water of the state (i.e. rivers, lakes, streams, storm sewers and ditches) must be authorized under a National Pollutant Discharge Elimination System (NPDES Permit). See Section 3.2.

WHERE TO GO FOR HELP

SUBJECT: **Wastewater discharge permitting**

CONTACT: DEQ, Water Bureau District Office
See Appendix C
www.michigan.gov/deqwater

SUBJECT: **Questions pertaining to industrial pretreatment standards that cannot be answered by your local publicly owned treatment works (POTW)**

CONTACT: DEQ, Water Bureau, Industrial Pretreatment Program
(517) 335-4107
www.michigan.gov/deqwater (select "Biosolids & Industrial Pretreatment," then "Industrial Pretreatment")

SUBJECT: **Storm water discharge Permits**

CONTACT: DEQ, Water Bureau, Storm Water Unit
(517) 241-8993
www.michigan.gov/deqwater (select "Surface Water," then "Storm Water")

PUBLICATIONS:

1. Scrap Metal Bins and Roll Off Boxes – Guidance Publication
2. Notice of Coverage (NOC) for National Pollutant Discharge Elimination System (NPDES) Storm Water Discharges from Construction Activities (EQP 4661)
3. Notice of Intent (NOI) for Coverage Under the National Pollutant Discharge Elimination System (NPDES) Storm Water Discharges Associated with Industrial Activities (EQP 4664)
4. Guidebook of Best Management Practices for Michigan Watershed Nonpoint Sources
5. Sample Storm Water Pollution Prevention Plans
6. Notice of Termination (NOT) for National Pollution Discharge Elimination System (NPDES) Storm Water Discharges from Construction Activities (EQP 4662)
7. Michigan's Permit-by-Rule for Construction Activities Rule 323.2190
8. Industrial Storm Water Operator Training Manual
9. Construction Site Storm Water Certified Training Manual

SUBJECT: **Wastewater discharges to the groundwater, including septic/tile field systems with more than 10,000 gallons per day discharge**

CONTACT: DEQ, Water Bureau, Groundwater Program
(517) 373-8148
www.michigan.gov/deqwater (select "Groundwater Discharge")

PUBLICATIONS:
1. Mobile Power Washing
2. Part 22 Groundwater Discharge Authorization Application

SUBJECT: **Questions concerning septic tank/field systems with less than 10,000 gallons per day discharge that cannot be answered by your local health department**

CONTACT: Local Health Department
www.malph.org

DEQ, Water Bureau, Land Division and Local Health Unit
(517) 241-1318
www.michigan.gov/deqland (select "Land Development")

PUBLICATIONS:
1. Michigan Criteria for Subsurface Sewage Disposal – April 1994

SUBJECT: **Lists of permitted and registered hazardous waste and liquid industrial waste transporters**

CONTACT: DEQ, Waste and Hazardous Materials Division District Office
See Appendix C
www.michigan.gov/deqwaste (select "Hazardous & Liquid Industrial Waste Transporters")

SUBJECT: **Wastewater operator certification and training**

CONTACT: DEQ, Environmental Science and Services Division,
Operator Training Unit
(517) 241-7199
www.michigan.gov/deqoperatortraining